REBEL YELL: GORHAM'S NEW CHOPPER!

March 1990

MODEL AIRPLANE NEWS

48120

USA $2.95

THE WORLD'S PREMIER R/C MODELING MAGAZINE

CANADA $3.75

CHECK THESE MODELS OUT!

MORE MODELING TIPS

03
71896 48120

MARCH 1990 VOLUME 118, NUMBER 3

MODEL AIRPLANE NEWS

ON THE COVER: Showing what many will consider to be the ultimate R/C accomplishments, our cover features a selection of scale models that were photographed at two recent, equally prestigious competitions. You'll find in-depth coverage of both the Scale Masters finals and the Schneider Cup Re-enactment in this issue. These photographs certainly invite the question, "Just how much more realistic can R/C models get?" (Kodachromes by Mike Richardson and John Sullivan.)

FEATURES

CONSTRUCTION

HELICOPTER SECTION

COLUMNS

DEPARTMENTS

EDITORIAL

by RICH URAVITCH

IN THIS ISSUE, you'll find coverage of the Lake Havasu Schneider Cup Re-enactment, as seen through the eyes of our floatplane guru, John Sullivan. It's interesting that we were "scooped" by that highly regarded business biweekly, *Forbes Magazine*. Its December 25 issue contained a two-page, four-color piece on the event, written by Michael Gianturco. My first reaction to this was that maybe we're starting to get the coverage we deserve and need to ensure our longevity as R/Cers, and that perhaps others are having the same ideas as those I had expressed in last month's Editorial (I urged all modelers to do whatever they could to "enlighten" non-R/Cers as to what our hobby is all about). After all, a large portion of the *Forbes* readership consists, no doubt, of movers and shakers from corporate America—people in high places whose exposure to R/C sure couldn't hurt, right? Well, not exactly.

After reading the article, something else became clear. It seems that in the honorable pursuit of elevating the status of our hobby, we tend to inflate some of the figures involved. The article says, and I quote, "One-third the size of the originals, with wingspans of about 8 feet, these custom-made replicas typically cost $17,000 and up." I don't know about the rest of you, but I sure hope my wife doesn't read that article! It goes on (and upward!) to point out that Cliff Adams' Supermarine S-6B cost $24,000! With numbers like that floating around, it might be difficult to convince anyone that they can afford to get involved with R/C! If we really *are* proud of our involvement and are talking about it among non-modelers, its value should be expressed in terms of skills, accomplishments, challenges and camaraderie, not how much money we have tied up in it!

Although, at this point, you're only just a few pages into the magazine, you've probably already noticed some changes. Our very talented Art Director, Alan Palermo, and his staff have given me a second anniversary present—a really freshened-up look to the graphics side of MAN. I think our new format looks great, and I'm sure you'll agree.

Those of you who are regular readers of this space will know I feel that, for any publication to be successful, it must be responsive to its readers—being easy reading and informative are two of the requirements. We already believe we're informative, and our new look is just one more step toward providing you with what you want in an R/C airplane publication. Hope you like it!! ■

MODEL AIRPLANE NEWS
THE WORLD'S PREMIER R/C MODELING MAGAZINE

Group Publisher
LOUIS V. DeFRANCESCO, JR.

Publisher
DR. LOUIS V. DeFRANCESCO

Associate Publisher
YVONNE M. MICIK

Editor-in-Chief
RICH URAVITCH

Associate Editor
CHRIS CHIANELLI

Copy Director
LYNNE SEWELL

Copy Editors
KATHERINE TOLLIVER
LI AGEN

Editorial Assistant
BRENDA CASEY

Art Director
ALAN J. PALERMO

Associate Art Director
MARY LOU RAMOS

Assistant Art Directors
BETTY KOMARNICKI
ANA MARIA VAS

Art Assistants
MICHAEL MAKUCEVICH
SARA CLARKE

Systems Manager
ED SCHENK

Systems Assistant
JACKIE MOSIER

Circulation Manager
KATHLEEN RHODES

Advertising Sales Director
JASON STEIN

Advertising Sales Coordinator
JULIA PEMBERTON

Production Manager
PENNY CURCIO

Production Assistant
MARY REID

SUBSCRIPTION PRICES:
U.S. & Possessions (including APO & FPO): 1 year $25.00; 2 years $47.00; 3 years $65.00. Outside U.S.: 1 year $35.00; 2 years $67.00; 3 years $89.00. Payment must be in U.S. funds.

MODEL AIRPLANE NEWS (ISSN No. 0026-7295) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone 203-834-2900. FAX: 203-762-9803. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. Micik, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional Mailing Offices.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher. The Publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by a SASE will be returned.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Model Airplane News*, Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: 203- 834-2900. FAX: 203-762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Model Airplane News*, Subscription Dept., P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

AIRWAVES

WHERE TO WRITE TO US
If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

Imported Fan Fan

I saw the MM Ducted-Fan Kit by Chart/MicroMold in the April '89 issue of *Model Airplane News* and wonder where I can buy it. Can you help?

DAVID GARRISON
O'Fallon, MO

Sorry, Dave; the MicroMold Fan Kit is very popular among British sport fanners, but I don't think anyone in this country imports it. If you write to MicroMold/Chart (Station Rd., East Preston, Littlehampton, W. Sussex, England, BN163AG), I'm sure they can help you. RAU

He Has a Plan, But No "Plans"

Do you have plans for Skip Mast's C-130 aircraft? I wrote to *RCM*, and Art Johnson said they were published three or four years ago in your magazine or in *Model Aviation*. I'm very interested, because I live in Van Nuys near the airport, and I watch these beautiful ships take off and land. I've taken many pictures for future detailing. If you have it, please send the plan number and price.

RICK CINCIS
Van Nuys, CA

Rick, you've come to the right place, and we thank Art for the referral. Designed by scale champ Skip Mast, the Hercules is available as plan no. 12811 and sells for $28.50, plus postage and handling. Send us some photos for "Pilot Projects." RAU

Monster Memories

Recently, I saw a picture that brought back many modeling memories of the late '50s. It was of Don McGovern's seaplane—originally called "McGov-

ern's Monster" and later renamed the "Custom Privateer." This majestic seaplane always caught my fancy, and I'd like to know if anyone can supply a set of plans. Thank you, and keep up the good work!

GEORGE W. SAUER
Georgetown, PA

George, this beautiful flying boat captured the fancy of many other modelers, too! As I recall, it was presented in Flying Models magazine when Don was the editor. As a kid, I often thought about building one, but I decided I didn't have enough glue, X-Acto blades, balsa, space, or money to consider the project. Come to think of it, I probably still don't! It would be nice to see one built again. Check with the people at FM; if they don't have the plans, they may be able to head you in the right direction. You must be quite a modeler—I mean, to have a town named after you...

RAU

Where's the Buccaneer?

I enjoy your magazine tremendously. The articles are informative, and the advertising keeps me up-to-date. I really enjoyed your recent issue on seaplanes. Over the past 25 years, I've flown everything I've built off water, and I can attest to the fun of it. If you live near one, a seaplane base is a good source of "how-to" info. A look at rigging, water rudders, etc., shows that it's relatively easy to duplicate a scale and sturdy installation.

Now a request: will someone out there in "kit land" please design a scale Lake Buccaneer with an 80- to 90-inch span with flaps, retracts, etc.? With all the new interest in water flying, there must be a market for this beautiful aircraft.

GORD SCHINDLER
West Hill, Ontario

Thanks, Gord. I couldn't have said it better! The Lake would make a great seaplane in the size you're suggesting. Anyone out there doing anything along these lines?

RAU

Carbon-Dioxide Dilemma Dispelled!

In your September '89 issue, Gus Wojcik of Berwyn, PA, wrote that he had trouble finding Telco CO_2 motors. Well, you can tell Gus to cheer up! The Telco motors are still available, and we produce thousands of units each year. We sell most of them through our UK dealers, but we do regularly export a number to the

(Continued on page 10)

AIRWAVES

(Continued from page 9)

USA via Sig Manufacturing and Peck-Polymers. If Gus calls either company, he's sure to obtain the motor and service he wants.

M.J. CALLAGHAN
Chart Hobby Distributors
West Sussex, England

Thanks a million, M.J. You got that, Gus? RAU

Elusive Lizzie

I'd like to purchase a kit or plan of an authentic Westland Lysander model with a wingspan of 60 to 70 inches. I'd appreciate any information you may have regarding this and the current cost.

JOHN ROBINSON
Toronto, Canada

Great! Finally, an opportunity for a "Dear John" letter! I'm not sure of the current cost, but I bet a card to Bob Holman Plans (P.O. Box 741, San Bernardino, CA 92402) will get you information on the drawings you need. Bob's catalog is a great source of some super plans, and many of them are imported. RAU

A Grandiose Scheme

What a fantastic hobby! Today, modelers can get virtually anything they want, with more new and exciting products being introduced every day. What more could you ask for? How about this?

I've been involved in R/C for almost 14 years, and I've seen many important changes take place. During that time, I've become an accomplished designer, builder, pilot and instructor. Much of my early knowledge came from reading the many fine publications available to modelers. I've used a lot of this information and, consequently, I have a lot of flying experience packed into those 14 years.

Something else is needed, though. Modelers are generally gregarious; they need the camaraderie and fellowship of others—hence the flying club. How do you disseminate information from club to club across the country? After all, their problems are your problems, too!

I propose that a team of three or four dedicated, highly experienced modelers travel across the USA, attend the major air meets and trade shows, and visit the regular flying fields that are the real backbone of our hobby/sport. To strengthen and expand our great hobby, a traveling air show/flight-training team and modeling symposium could offer professional support and help solve problems. In the next few years, membership could double or triple!

Tremendous exposure could mean TV coverage of our major events, advertising in non-model-related publications (e.g., *Popular Science* and *Better Homes & Gardens)*, and an increase in popularity and acceptance on a national level! How about, "The official hobby of the 1992 Olympics!" We could do it! All we need are the right individuals, a solid plan of operations (who do you suppose might have one of these already?) and financial backing to make it all happen. Private support would be ideal, but don't you think manufacturers could also benefit from this (hint, hint)?

If anyone else out there is as excited about this as I am, please drop me a line. I'd liked to get started ASAP!

BRIAN L. REED
RD# 4, Box 747
Franklin, PA 16323

Wow, what a plan, Brian! Are you sure you've given us your correct address?—seems like Madison Avenue might be more appropriate! Al-

(Continued on page12)

AIRWAVES

(Continued from page 10)

though we view this subject from a different perspective, we couldn't agree more with a plan that expands our numbers and brings some positive exposure to R/Cing. This could be the beginning of a very interesting exercise, so we're printing your entire address with the idea that other modelers might contact you and help move things along. Be sure to keep us advised of your progress.

RAU

Liked the Fantrainer

I'm 14 years old, and I've been flying a Scat Cat 500 for a over a year. Now, I'm looking for a change in aircraft. The construction article for the 1/2A Fantrainer in the January '90 issue looked interesting. I was amazed by its size and performance. Where could I find information on small, inexpensive ducted fans. Can you help?

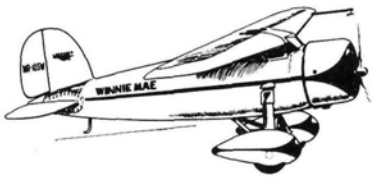
JEFF ATKINSON
Highland Village, TX

Jeff, I'm glad you liked the Fantrainer we presented. Apparently, many of our readers share your view, as the plan is proving to be very popular. I'm not sure what you consider a "small" ducted fan, but the smallest unit that's currently available is the Kress RK-720, which is just a shade over 3 inches in diameter. Next up are the old Midwest RK-20 and Kress RK-740 units, and these are right at the 4-inch mark. As you probably know, the Fantrainer uses the popular Cox T.D. .049/.051, and it drives a cut-down, but conventional, three-blade pusher prop in a tightly fitting shroud. Go ahead—give the Scat Cat a rest, and try a Fantrainer! RAU

In Search of Winnie

After a year of searching, I still can't find a kit of Wiley Post's Lockheed Vega "Winnie Mae." Surely, this famous plane would be commercially viable. Do you know where I can find such a kit?

J.J. JOHNSON
Georgetown, TX



J.J., the search may involve a few more years at the current rate! I don't know of any kit. I suppose you could really do an ultra kit-bashing job on the old Bridi Lockheed Sirius kit, but that would be a lot of work. A Winnie Mae kit might not be commercially viable, and please don't call me Shirley! RAU

Beyond the Twiliter Zone!

I'm 14 years old, and I'm very interested in the hobby. I've been working on a Twiliter Two for about six months, and I'm already thinking about my next model. There's a lot of information about first airplanes, but I can find little about second airplanes. I like the Sig Citabria; would it be too hard for me? Please help.

BRANDON TINKLER
Arlington, TX

Brandon, you must get serious about the hobby! It didn't take Randy Randolph six months to grow the balsa trees to produce the materials for his prototype Twiliter Two! Seriously, if, by "first airplane," you mean a basic trainer, then your second airplane

(Continued on page 72)

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and length.

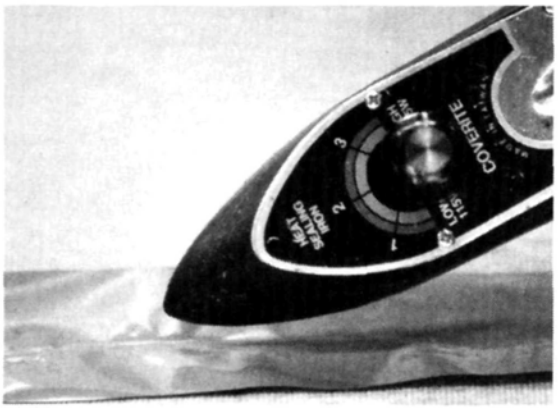
TECH TIPS:

by BOB CARPENTER

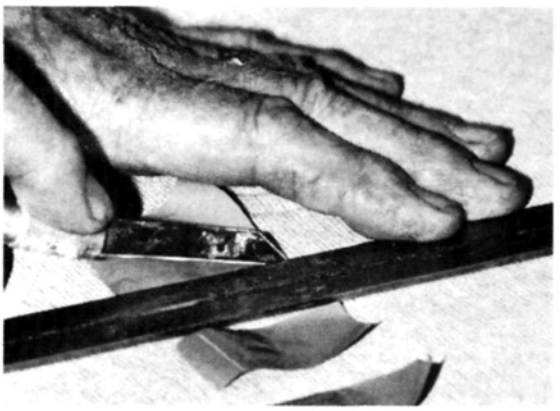
IRON-ON GAPLESS HINGES

NO DRILLING; NO SLOTTING; NO PINNING; NO GLUING; EASY TO MAKE AND VERY FUNCTIONAL

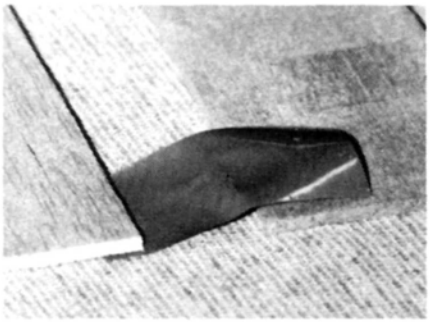
Gapless hinges have several advantages over plastic ones—better aerodynamics, superior strength, etc. You can't buy pre-packaged, mylar, gapless hinges at your local hobby store, but you can easily make them.



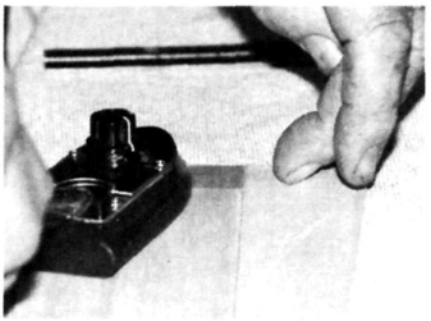
1. Lay two, 1-inch-wide strips of your covering material on your workbench. (I used 12-inch pieces.) Turn one of the strips over so it's sticky-side up, and overlap it about 1/4 inch, lengthwise, with the other. Use a heat-sealing iron to tack the strips together.



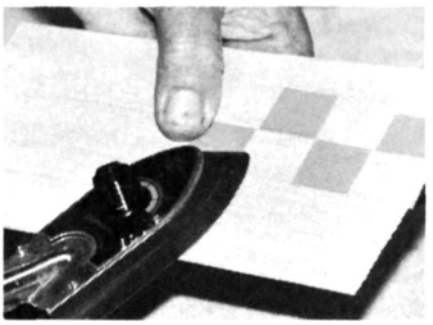
2. Cut the joined material into 1-inch-wide strips. These are your hinges, which now have the sticky side facing upward on one end and downward on the other.



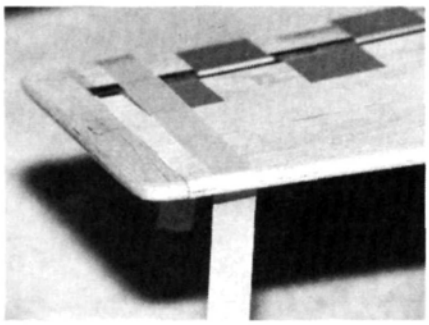
3. Place one of the strips in an over/under position between the two pieces you want to hinge, making sure the sticky sides face the wood.



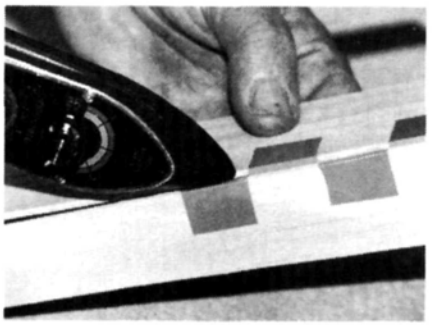
4. Be sure the seam formed by joining the two pieces of covering material (in step 1) lies directly between the two pieces of wood. Iron one side until it sticks.



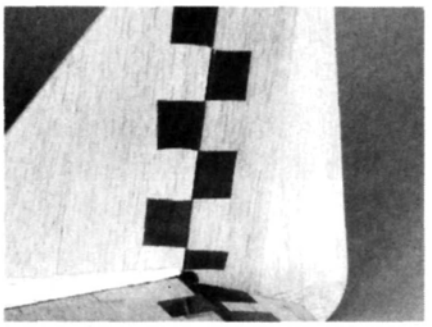
5. Turn the two pieces of wood over, pull them together tightly and iron the other side of the material. Don't worry—you can't pull them together too tightly.



6. If you're struggling to keep the two pieces of wood together, use a piece of masking tape on each end until you've completed three or four hinges.



7. When you've finished the elevator, rudder or aileron on which you're working, tack down the covering to the inside of the gap.



8. You'll be amazed by how freely joints with gapless hinges move. Now, complete the covering of the airframe in the usual way.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

$END IN YOUR SNAPSHOT$!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we'll feature pictures from you—our readers. Both color slides or color prints are acceptable.

All the photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1990. The winner will be chosen from all entries published, so get a photo or two together plus a brief description and send it in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

MARY HAD A LITTLE FLIGHT...

David Chapdelaine of Mansfield Center, CT, sent us a few photos of his original design, which he calls "Lil' Mary." Although shown here on static display, powered by a Como .51, his attractive model has now logged over 100 flights. Dave designed Lil' Mary with a 50-inch wingspan and drew what he thought were "pleasing lines." We agree!

STILL CHAMPION!

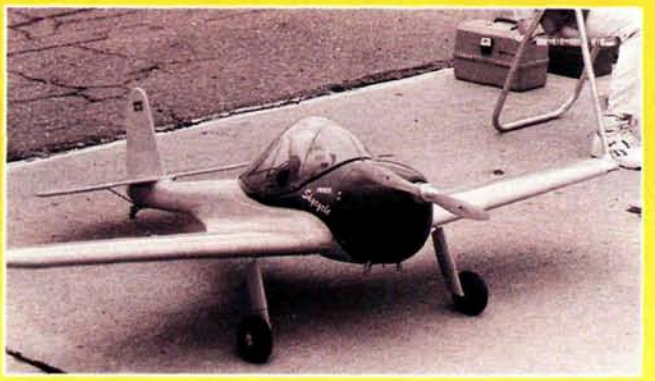
Although Glenn Elliot of Houston, TX, didn't include very much information on his Aeronca Champ, he did say that it's 1/4 scale, powered by an O.S. FS90 and controlled by a Futaba radio system. We concluded a number of things on our own: it's a pretty model, built (maybe) from the Bud Nosen kit; looks extremely realistic in a low Texas sun; and, if the "N" on the wing were any longer, the wing would have to be stretched. Great scale subject!

PARISIAN KNIGHTS... QUITE AN EIFFEL!!

Keith Tucker of Camden,TN, sent us this photo of the Paris Aeromodelers during their 3rd Annual R/C Air Show in Paris, TN, last October. Keith says that the weather was perfect: plenty of sunshine, mild temperatures and light winds (just like a spring day in the other Paris). Nice mix of airplanes on hand: we see a giant P-51, a Spitfire, a Laser, a CAP-10 and a Seniorita, plus other popular fun-fly types.

THE PLANE IN MAINE FLIES MAINLY IN...

We guess it's only natural for a modeler who works for an air charter service on Moosehead Lake in Greenville, ME, to prefer seaplanes. Dave Hall painted his 1/5-scale Pica Cessna 182 to resemble a Hawk XP II, powered it with a Webra .91 Speed and mounted it on scale floats. The result? Winner of the 1989 Point Sebago Sport Scale Meet. Nice job, Dave.



PRETTY PIPER PROTOTYPE

Even though it's 1/3 scale, the span of this Piper Skycycle is only 80 inches. Scratch-built by Donald Baker of Turlock, CA, it uses an S.T. 2500 for power and a 5-channel Futaba PCM for guidance. Don flew the 20-pounder at the QSAA meet in Las Vegas, and admits that its excellent flying qualities generated a lot of interest. The fuselage of the one and only Skycycle was made, in part, from an external fuel tank.

BRIT BEAUT!

British Aerobatic Champ in 1986 and a member of their aerobatic team for the last four years, Terry Westrop sent us photos of his Loaded Dice design. He asks if we'd be interested in publishing it for our many pattern enthusiasts. (That's kind of like asking Margaret Thatcher if she has any interest in politics!) The slippery-looking design is sure to create "winners" on this side of the pond also; so post it straight away, Terry!

MODEL MISNOMER?!

Can you imagine?—a model this sharp being called the "Turkey Buzzard"? That's what Nick Agneta of N. Bellmore, NY, decided to call one of his latest creations. The model spans 50 inches, is powered by a McCoy .35 (don't check your local hobby shop for that one!) and is fitted with a Perry carburetor. Nick used a little of everything in its construction, including oak, plywood, balsa and fiberglass. Its origin? It's a scaled-up version of a model Nick designed and flew on a control-line "back in the early '50s."

CANADIAN CONTROL COMBINATION

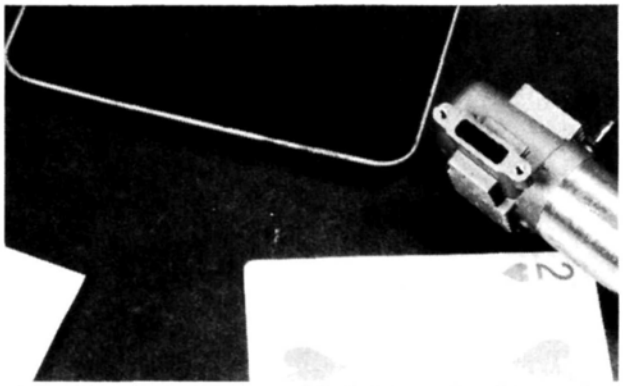
Seventy-five-year-young Joe Laberge of Sudbury, Ontario, may have stumbled onto something here. Since *MAN* is strictly an R/C magazine, we didn't at first know where to fit his Sig J-3 Cub into our pages. The picture tells the story: although the Cub is *flown* by control line, its throttle is controlled by radio. That qualifies it as R/C...we guess! The approach isn't new to Joe; he has used it on a variety of other scale models during the last five years—kind of a wireless/wire-control system!

HOW TO: Gaskets The Easy Way

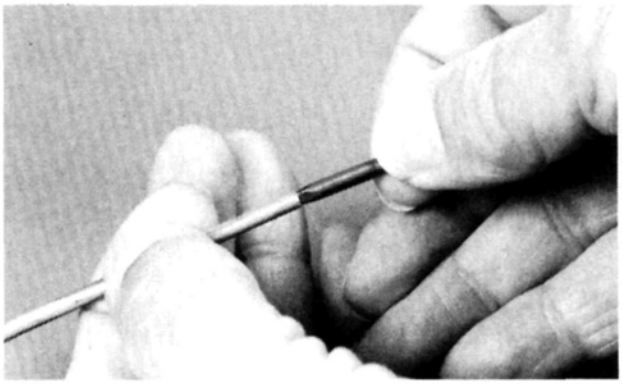
Metal-to-metal joints can leak. Here's the cure.

by RANDY RANDOLPH

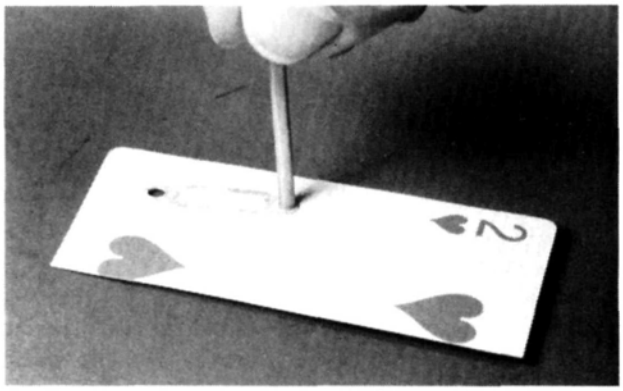
Gaskets are very important to any engine; without them, sealing two mated parts would be much more difficult and expensive. Here's an easy way to make replacements for damaged or lost gaskets.



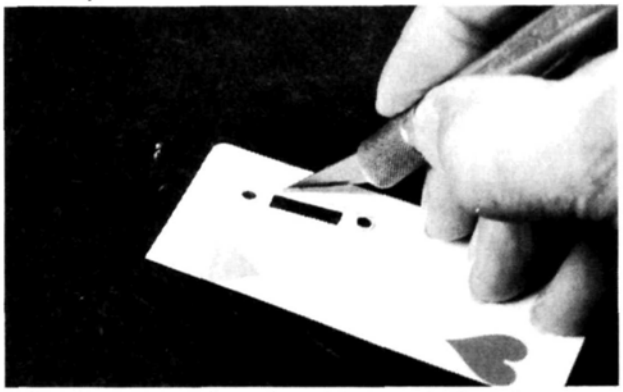
1. You'll need two things—an inked stamp pad and a non-plastic playing card. Ink the part for which you're making a gasket on the pad and stamp its outline on the card.



2. It's difficult to drill or cut holes in card stock, but a punch works well. Spin the inside of a brass tube of the proper diameter against a nail (or the end of a small file) until the edge is sharp.

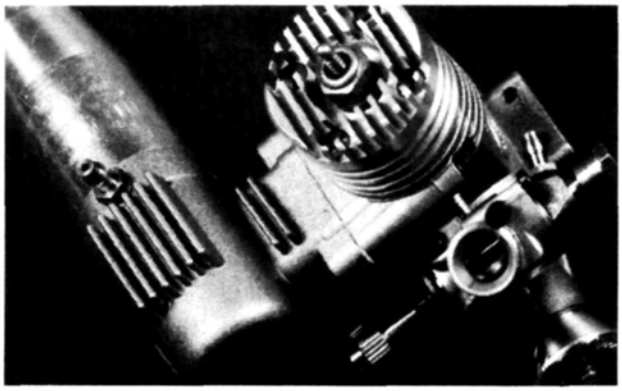


3. Place the card on a hard surface and press and spin the punch where the holes are marked.



4. Finish cutting out the gasket with a razor knife with a No. 11 blade. For best results, work on a hard surface and trim the center first, then the outline.

5. This completed gasket seals the joint between engine and muffler and, thanks to the stamp pad, the holes and exhaust port fit perfectly. The playing card's fancy back is showing!



6. You can barely see the gasket, but with it in place, the engine deposits no exhaust or fuel on itself, the fire wall, or the mount.

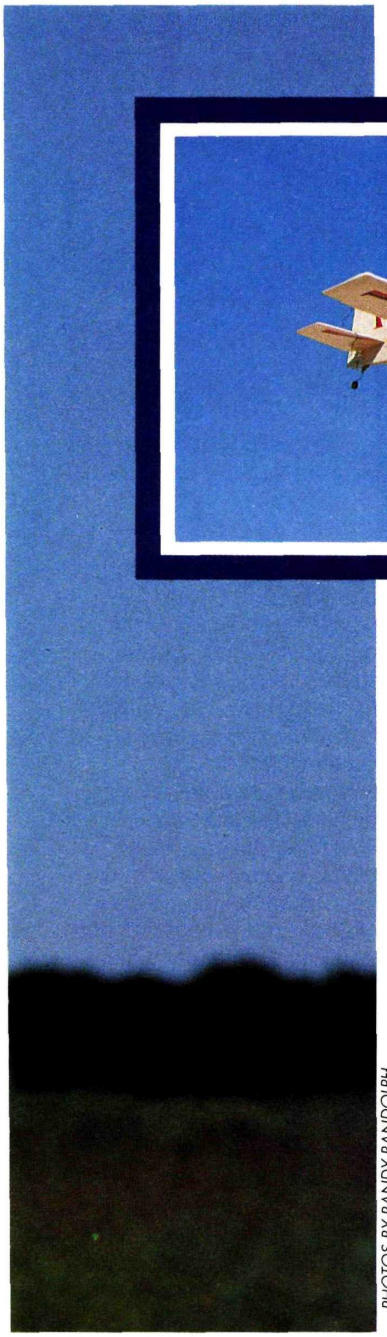
CHIPS

by RANDY RANDOLPH

CHIPS WAS CONCEIVED as a way to show off the capabilities of the excellent Super Tigre .11. The original idea was to produce a scale "reminder" of the well-known deHavilland Chipmunk, but as construction progressed, things changed!

For fast, easy construction, I decided on a constant-chord wing with only the ailerons being tapered. The cowl, turtle deck and canopy have slab sides to reduce the frontal area and the time you have to spend planking, filling and sanding the curves. There's no need for the awkward linkage that's necessary to steer a tail wheel, because I changed the rudder to full depth rather than stopping it at the top of the stab, as on the Chipmunk.

The final change was to the landing gear. An airplane that has its landing gear mounted on its wing is like a fish out of water when the wing is removed. When the landing gear is mounted on the fuselage, it's much easier to make adjustments, do repairs and



PHOTOS BY RANDY RANDOLPH

Started out as a Chipmunk, but the pencil slipped! Randy's newest small-stepper for .10 to .15 power

charge the battery, because the airplane can stand on its own!

When I had made all these changes, the finished product didn't look like a Chipmunk any more; hence, the name change. Nevertheless, it does aerobatics just as well as its full-scale counterpart, and with a .10 or .15 engine, its fuel demands are low and the cost of flying it is very small indeed!

THE WINGS: This is a good place to start any aircraft project!

Cut the ribs from 1/16-inch sheet balsa. They can be cut one at a time from a printed sheet made by tracing around a card-stock template with a fiber-tip pen; or they can all be cut simultaneously by stacking balsa blanks, tracing the rib pattern on the top one and cutting the ribs out with a band saw or jigsaw.

If you use the printed-sheet method, stack and pin the pieces together after they've been cut out, and then sand their edges to smooth out any irregularities.

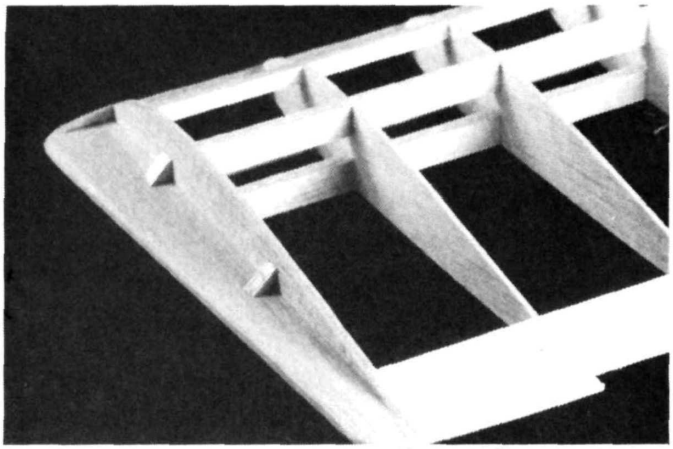
Select four ribs and trim 1/16 inch off the top and bottom of each, and 1/32 inch off both sides of the spar notch. These are the center-section ribs, and they're undercut to accept sheeting. Cut the webs from 1/16-inch sheet, taking the grain into account. Spars can be bought, but I prefer to strip them from an appropriate sheet of wood. For this, I use a straightedge and razor knife, or a balsa stripper.

Your choice of wood depends on its purpose. The wing spars should be cut from firm stock, but the leading edge can be made of a slightly softer wood. For the trailing-edge sheet, use medium-weight quarter-grain stock; slice the tip pieces from soft 1/8-inch sheet, again noting the grain in each piece.

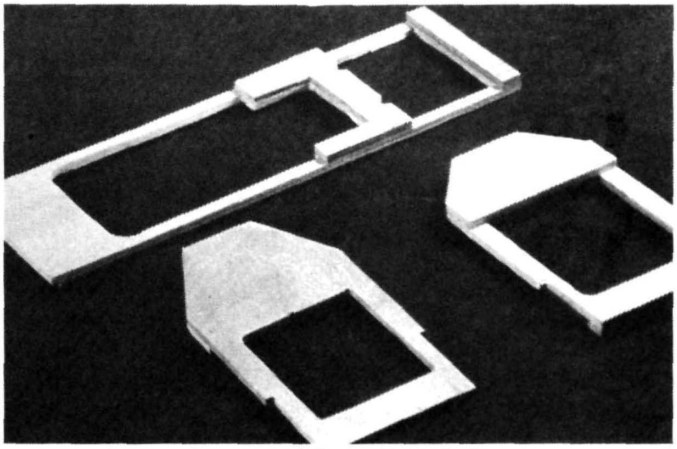
Build the wing halves. First, protect the plan with wax paper, then pin the bottom main spar into place on it. Next, slip some ribs onto the spar and use them to position the trailing-

SPECIFICATIONS

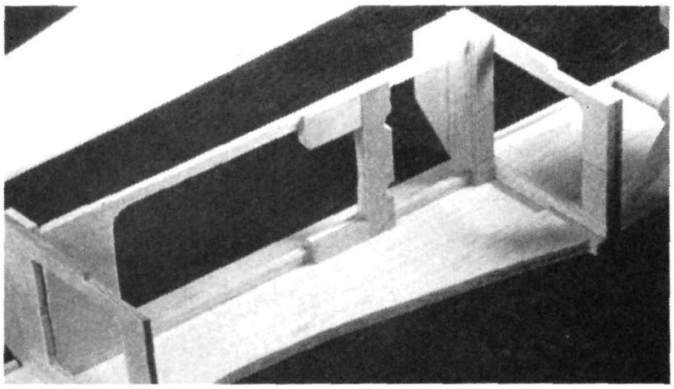
Type: *Sport flier*
Span: *41 inches*
Area: *308 square inches*
Length: *32 inches*
Wing Loading: *16 ounces/square foot*
Power Req'd: *.10 to .15*
No. of Channels Req'd: *4*
Materials: *Conventional balsa and ply*
Comments: *Chips is a solid, smooth airplane that rewards its builder with a performance that far outweighs its cost and the time it takes to build.*



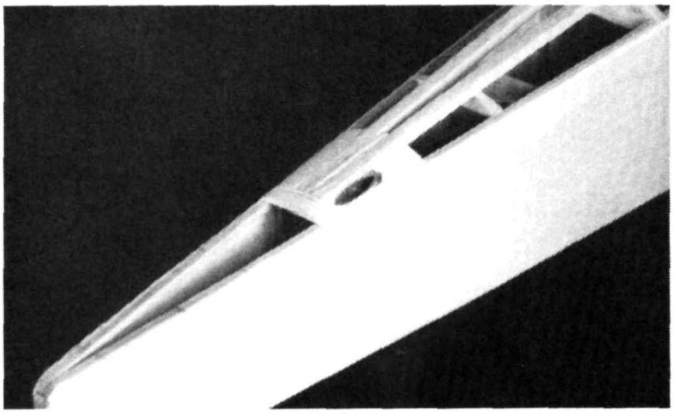
Small gussets keep tips true during sanding and allow the covering material to fair them smoothly into the wing.



The two fuselage formers and the crutch are built up from balsa and plywood.



When the crutch is assembled between the two formers, it provides a place to mount the servos as well as keeping both formers and the fuselage sides in alignment.



Fill between stringers at the tail to allow the rudder Nyrod to exit smoothly.

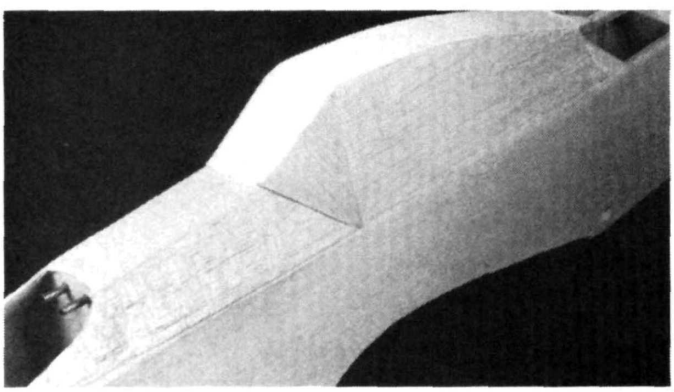
edge sheet so that it matches any slight difference there might be between the length of the ribs and the plan. Pin the trailing edge into place and, starting with the second, trimmed, center rib, glue the ribs and webs into position. The center ribs will be added after the wing halves have been joined.

When all ribs and webs have been installed, add the top main spar and the trailing-edge strip. Make sure the spar is glued to all the webs and ribs. The front top spar can now be installed, but don't add the top trailing-edge sheet yet; it will be installed after the wings have been joined at the dihedral joint. Build the other wing half in the same way.

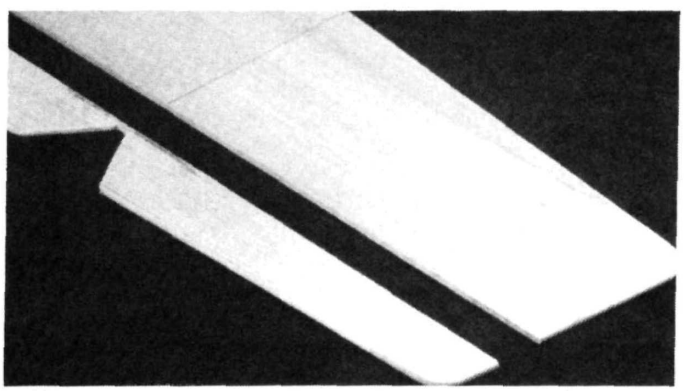
When the halves are complete, sand the center spars and trailing edges to the dihedral angle, and slice the dihedral braces from 1/16-inch plywood. Place one wing half flat on the bench, raise the tip of the other 1 1/2 inches, and install the braces. Check for fit, then glue all the joints.

Cut the two remaining center ribs at the spar notch; separate the aft segments to form the servo well, and glue them into place. When everything is dry, install the top trailing-edge sheet, the bottom front spar and the leading edge. Sheet the center section, leaving the top of the servo well open.

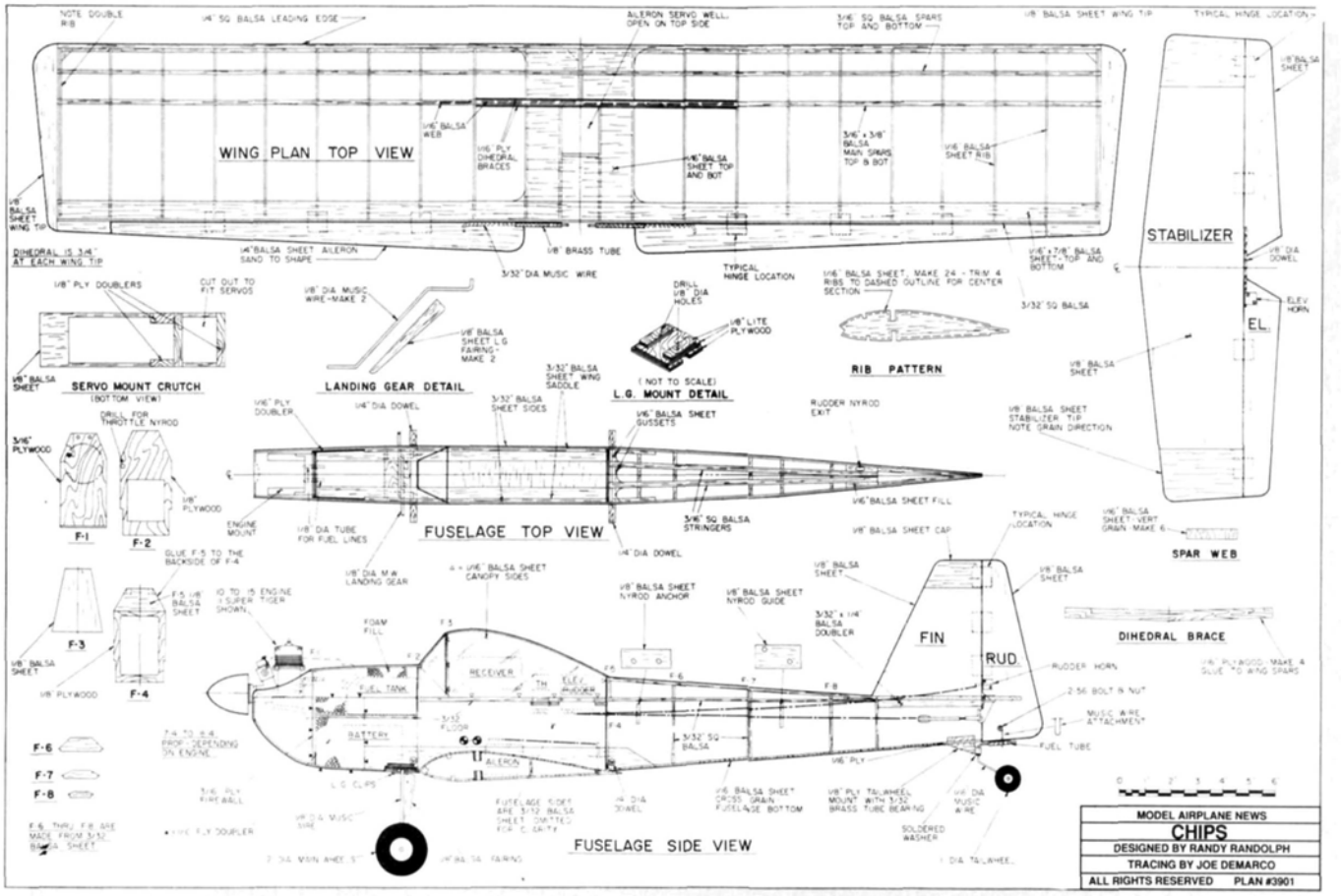
Cut the ailerons from 1/4-inch sheet and sand them to shape. Cut 2 inches from the tip of each and glue these pieces to the trailing edges as shown. Add the wing tips. Now sand the complete wing and epoxy the aileron torque-rod assembly into place at the center section. The ailerons will be installed on the wing when it's covered.



Once the side "canopy" pieces are in place, the whole fuselage can be sanded and prepared for covering.



Cross-grain tips are added to the sheet tail assemblies to help eliminate any warping caused by the covering material.

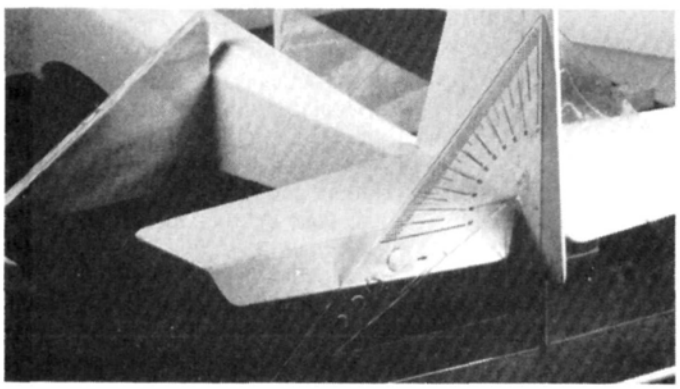


The fin-rudder and the stab-elevator are cut from medium sheet balsa. (Note the grain change at the tip of the stab and at the fin.) Round the edges and sand them smooth. Cement the 1/8-inch, dowel, elevator half-joiner into the leading edge of the elevator before making the rudder cutout. The movable surfaces will be hinged when they're covered.

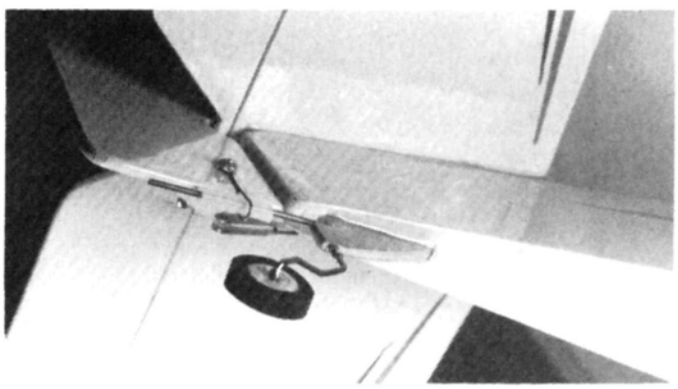
THE FUSELAGE: This is just a simple box with a couple of extra pieces added at the top to give the appearance of a cockpit or cabin area. Cut the two sides from 3/32-inch balsa sheet and add the doublers, the top longeron and the uprights, and the ply triplers.

Slice the crutch from 1/8-inch balsa sheet (the servo cutout should match the servos you intend to use), and add the 1/8-inch ply servo mounts. The cabin formers F2 and F4, with the crutch between them, are glued into position on one

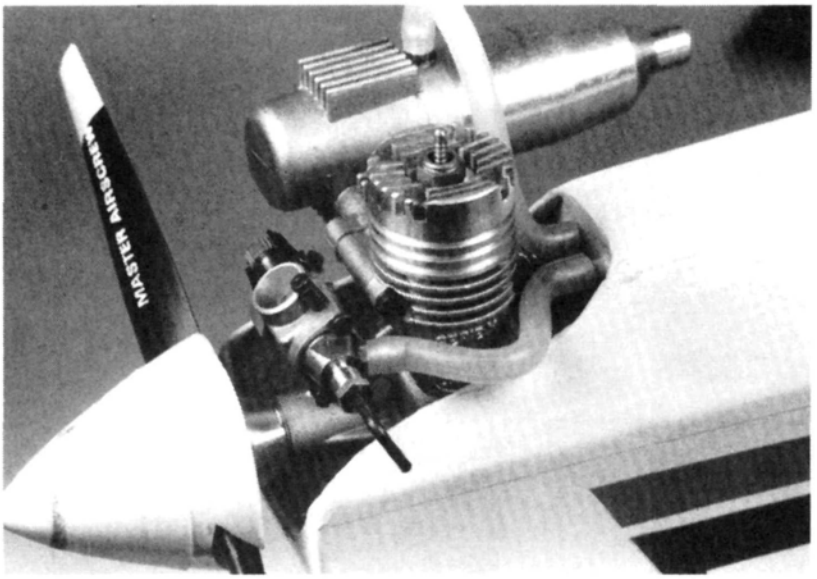
ORDER THE FULL-SIZE PLANS...PAGE 114



Right triangles on both sides of the fuselage and rudder ensure alignment while the stab is epoxied into place.



Tail-wheel installation is light and foolproof. Tiller and fuel tube provide some shock relief for the rudder.



The ST X.11 fits nicely into the cowl. Muffler pressure helps eliminate needle-setting variations as fuel is depleted.

of the fuselage sides, followed by the other fuselage side piece being glued in the opposite, but corresponding, location. Before you apply the glue, be sure the outlines of the two sides match exactly.

Bevel the inside of the fuselage sides at the tail and then bring the sides together and glue them. Add the three, aft, turtle-deck formers and the two 3/16-inch-square stringers. Using sheet scrap, fill between the stringers where they meet the stab saddle.

Drill the fire wall for the engine-mount bolts, the throttle and the fuel lines. Install T-nuts; epoxy the 1/8-inch brass fuel and overflow lines through the fire wall; then epoxy the fire wall into position between the fuselage sides.

Install the fuel tank and the throttle line. (In the original plane, the tank was wedged into place with foam.) Glue the turtle-deck side sheets into place, allowing them to extend almost to the canopy's former location. Using a sanding block, sand these pieces flush with the top of the fire wall and F2, then add the top piece from F1 to F2.

Glue the canopy former F3 into place; cut the canopy sides according to the plan; and glue them between F3 and F4. Once again, sand both sides flush with the two formers, then add the top cross-grain sheeting.

The windshield's side and center pieces complete the cabin area. Glue the aft fuselage formers into place, and add the two 3/16-inch square stringers. Fill the area between the stringers and the fuselage just in front of the stab with 1/16-inch sheet scrap.

Build up and glue the landing-gear mount just in front of F2. The fuselage sides should be relieved about 1/16 inch in this area to allow the mount to blend with the 1/16-inch sheet that will be added later.

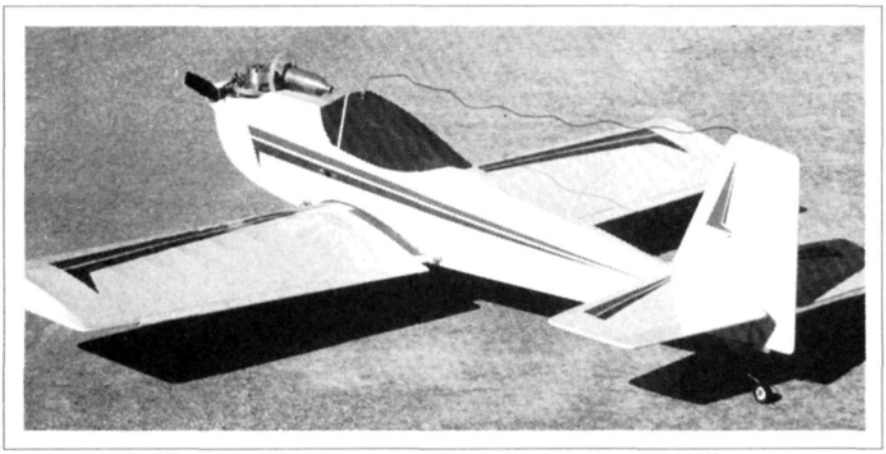
Install the rudder Nyrod guide from the cabin area through the aft turtle deck just in front of the rudder. The elevator guide exits just below the stab on the airplane's left side. Add the bottom 1/16-inch plywood for the tail-wheel mount, and sheet the rest of the bottom with cross-grain 1/16-inch sheet balsa. Trim the cowl area to fit around the engine, and sand the finished fuselage.

I covered the airplane with MonoKote* and also used it for the hinges. Add the ailerons after they and the wing have been covered.

Make the landing gear by bending 1/8-inch music wire. Sand the gear fairings to shape and cement them into place on each leg; then cover them and mount the wheels. The tail-wheel mount is cut from 1/8-inch plywood with a 3/32-inch brass-tube bearing cemented into place with CA. Bend the tiller, slip the 1/16-inch wire through the tail-wheel mount and finish bending the axle, and then install the wheel.

Slot the 1/16-inch plywood mount plate and epoxy the completed tail-wheel assembly into place. Make the U-shaped tiller bracket by bending soft 1/32-inch wire

(Continued on page 72)



Chips at rest

BASICS OF

OF RADIO CONTROL

RULES OF THUMB

by RANDY RANDOLPH

WHEN designing and building an R/C plane, a number of tasks are so general that they fall under the description of "what looks right." That's very nebulous to those who aren't familiar with airplane construction, but over the years, various rules of thumb have become "what looks right" to most modelers. Let's look at a few of the more common ones.

BALANCING ACT

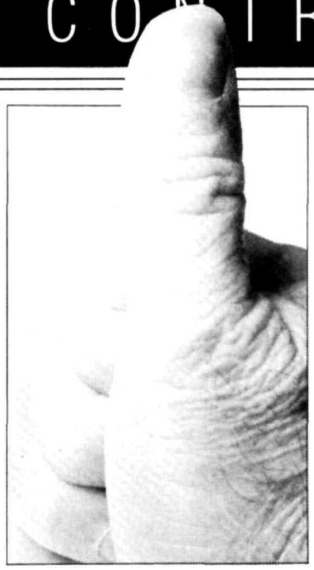
The balance point of most R/C airplanes should be about 25 percent of the wing chord aft of the leading edge. That's a much-quoted rule of thumb that works well for constant-chord wings because that point doesn't move as you progress from root to tip.

But what if the wing is swept back a great deal? If the balance was at 25 percent of the chord at the root of such a wing, the airplane probably wouldn't fly, but would be very unstable and uncontrollable because it's tail-heavy. The rule should therefore be modified to read "25 percent aft of the leading edge at the Mean Aerodynamic Chord" (or MAC). That rule works better, but where *is* the mean aerodynamic chord? Time for more rules of thumb!

The easiest way to get a working ballpark figure for the balance point of a constant-chord, swept-back wing is by dividing the total sweep of the leading edge (expressed in inches) by two and adding the result to the chord. Then multiply that number by .25, and measure back from the leading edge at the wing root.

Using this method, a swept-back wing with a constant chord of 6 inches and a leading-edge sweep of 6 inches would have its CG 2.25 inches back from the leading edge (at the root). This represents the 40-percent point of the root chord, rather than the 25-percent point that would be used if this wing had no sweep.

If a swept-back wing is also tapered, you must first find the average chord.



This can govern many things that make an airplane fly properly; and we don't mean just on the sticks!

Rule of thumb: the numerical value of the *average* chord of a wing is the total wing area divided by the plan. (The job is now half done.) Find the spot on the wing where the chord length matches this dimension. Measure the sweepback in inches at this point; add this dimension to the average chord; find 25 percent of this new number and measure back that distance from the leading edge at the average chord. You now have the balance point. (These figures determine the 25-percent point; 33 percent would make a safer, slightly more aft, CG point.)

DIHEDRAL DATA

High-performance jet aircraft have, to some degree, changed our ideas of how an airplane should look, but most other airplanes look better with some dihedral; in fact, dihedral is *absolutely necessary* in some models, if they are to fly at all!

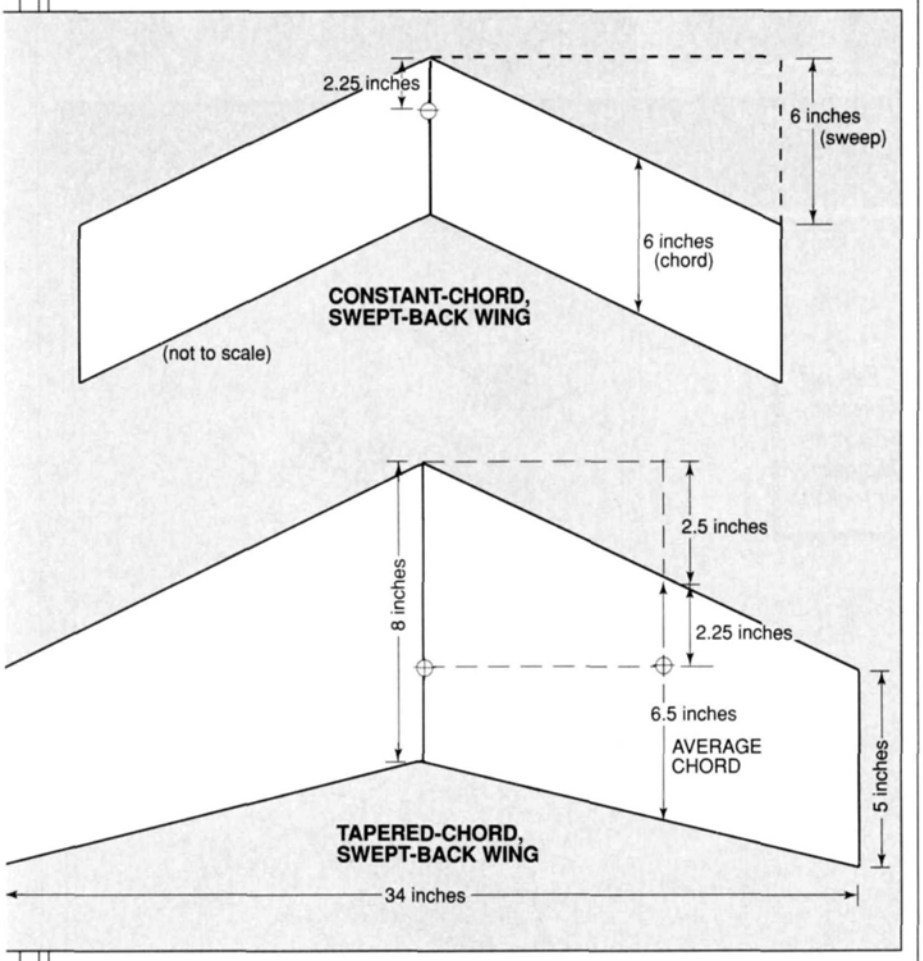
If an airplane has ailerons for roll control, the amount of dihedral it takes to make it "look right" may be just enough to keep the wings from looking as though they're drooping. But what if it has no ailerons?

Rule of thumb: R/C airplanes that have no ailerons and fly only with rudder control need at least 4 degrees of effective dihedral to fly properly.

A BASIC PROGRAM

This simple basic program for V-dihedral will calculate the height to raise one wingtip (with the other panel flat) to achieve the desired angle.

```
5PRINT "¦": REM * TO CLEAR SCREEN
10    DIM P$(2)
15    ? "TOTAL WINGSPAN",,:TRAP 15:INPUT S1
20    ? "DIHEDRAL ANGLE DESIRED",,:TRAP 20:INPUT A1
30    M3=INT(((64*S1*A1)/3600)*10+0.5)/10
40    PRINT ""
60    ? "RAISE ONE TIP ";M3;" INCHES WHILE OTHER PANEL IS FLAT."
65    ? ""
70    ? ""
75    PRINT "WANT TO DO IT AGAIN? Y,N)":INPUT P$
80    IF P$="Y" THEN GOTO 5
85    IF P$="N" THEN END
```



The catch here is, what *is* "effective dihedral"? That question calls for another rule of thumb: a high-wing airplane with a flat wing (no actual dihedral) has an effective dihedral of +2 degrees; a low-wing airplane with the same wing has an effective dihedral of -2 degrees. It's simpler to combine the two rules into one: when the rudder is the primary control, for turning, high-wing airplanes need at least 2 degrees of actual dihedral and low-wing airplanes need at least 6 degrees. Note that these rules give a *minimum;* an extra 1 or 2 degrees is usually better!

With dihedral, there are other factors to be considered. The wing's aspect ratio, or whether it's swept back or forward make a difference to a plane's effective dihedral. Naturally, there are rules of thumb to cover these as well.

Rule of thumb: each degree of sweep-back is about equal to 1/2 degree of dihedral, and sweep-forward subtracts 1/2 degree.

Tail size is important to the stability of an airplane, and there are some general rules: when the distance from the trailing edge of the wing to the leading edge of the stab is about twice the average chord, the stab/elevator and fin/rudder areas should be between 20 to 25 percent and 7 to 9 percent of the wing area, respectively. The longer the tail-moment arm, the smaller the tail areas can be and still maintain stability.

Airplanes that "look right" tend to follow all these rules and fly in a way that can be described as "comfortable." Nothing makes fliers more uncomfortable than an unstable airplane! *That's basic!* ■

HINTS & KINKS

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

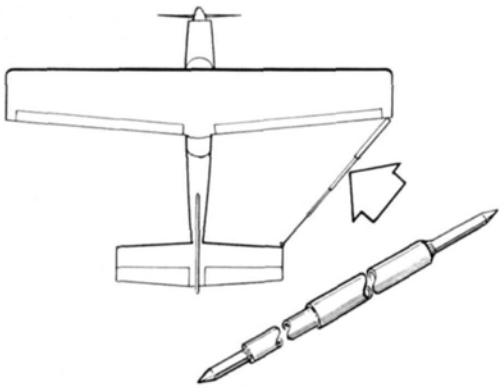
by JIM NEWMAN

Starting with this issue, we're expanding Jim Newman's "Hints and Kinks" (one of our most popular columns) to two pages! Since many new modelers may not have seen them, we've decided to reprint the best tips from past issues. Just goes to show that good ideas endure and, in many cases, are worth repeating. Hope you enjoy it!!—RAU

NON-CLOGGING AEROSOLS

This is a problem for everyone who uses aerosol spray paints. Even when we follow the directions, invert the can and spray until no more paint comes out, the head tends to clog! Lionel has a solution. He fills the center well of the cap with thinner and stores the can upside-down so that the head is submerged. Caution!—make sure your spray can's cap isn't made of a plastic that dissolves in thinner.

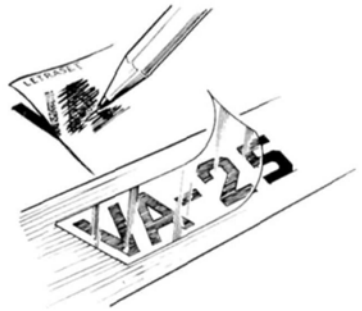
Lionel J. Lusardi, Maywood, IL



TELESCOPIC MEASURING ROD

Old telescopic radio antennas make great measuring rods for aligning/rigging new models. Here, an antenna is used to check the wing's alignment before holes are drilled for the wing bolts. The rod would be even easier to use and more precise if a nail were glued into each end.

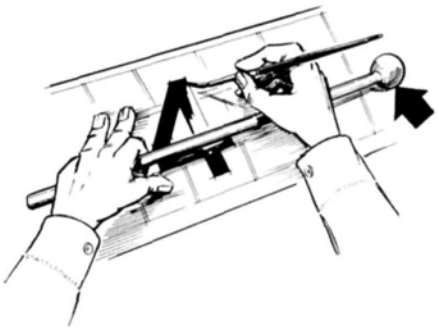
Eugene King, Buffalo, NY



RUB-ON LETTERING

Rub-on lettering is sensitive to fuel and must be protected by a small piece of self-adhesive Mylar film. Alternatively, spray a mist coat of clear urethane varnish or epoxy over the letters.

John Nullmeyer, Newark, CA



SIGN-PAINTER'S MAHLE STICK

A sign painter bridges his wet lettering with a Mahle stick on which he steadies his brush hand. To make your own comfortable hand rest, glue a small rubber or plastic ball onto the end of a 1/2-inch-diameter dowel or a yardstick.

Henry Loos Sr., Waterford, NY

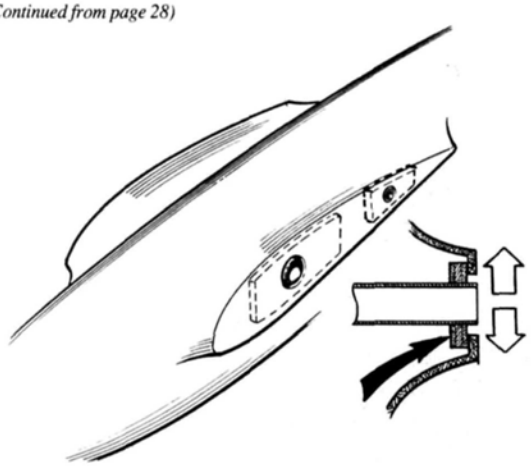
COPIER IMAGE TRANSFER

If your copier gives accurate reproductions of parts, i.e., neither reduced nor enlarged, you can transfer those images to wood. Place the copy face down on the wood and hinge one end with tape. Firmly burnish the back of the paper with a cotton ball or wad of paper towel dampened with dope thinner, periodically lifting the paper to check the transfer. Too much thinner causes the black toner to bleed, so you'll need to experiment to get the right amount.

John French, West Haven, CT

HINTS & KINKS

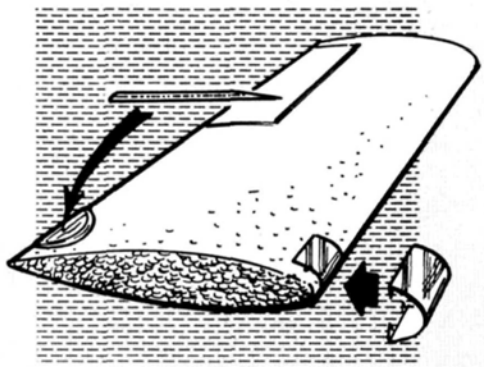
(Continued from page 28)



WING-ROD ALIGNING

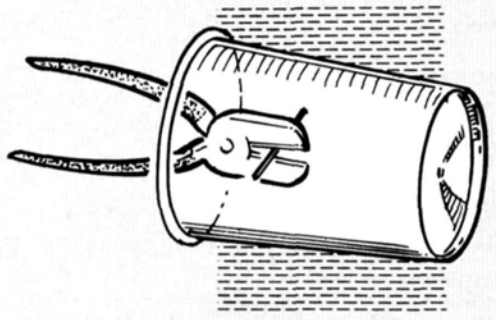
Installing wing-rod tubes through a fiberglass fuselage so that the wings are at the same angle of incidence is a tricky operation. Try this technique: drill the holes in the fuselage slightly larger than you need, then cut plywood inserts to fit inside the wing root so the ply fits tightly over the tubes. Firmly jig the fuselage to the bench, attach and adjust the wings until the left and right angles of incidence match. Then tack the ply scabs to the fiberglass with a shot of CA, remove the wings and set everything solid with fiberglass and glue, filling the spaces around the tubes with microballoons and glue.

George Voss, Oklahoma City, OK



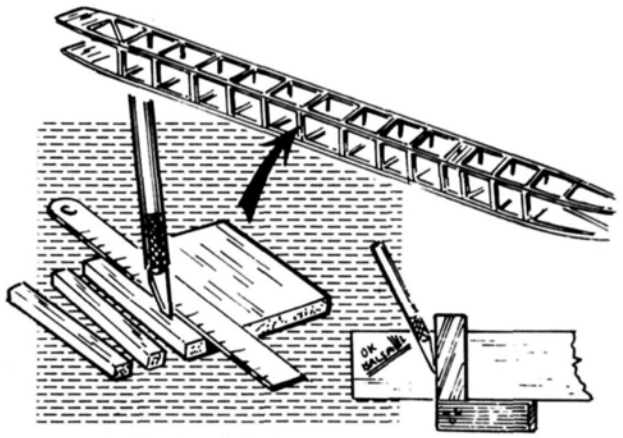
EDGE PROTECTION

The foam wings on ARF models are prone to being damaged by rubber bands. Glue half circles of 1/16-inch plywood (1 1/4-inch radius, rounded and bevelled as shown in the cross section) over the trailing edge to take the pressure. For the leading edge, bend soda-can stock and epoxy it into place.



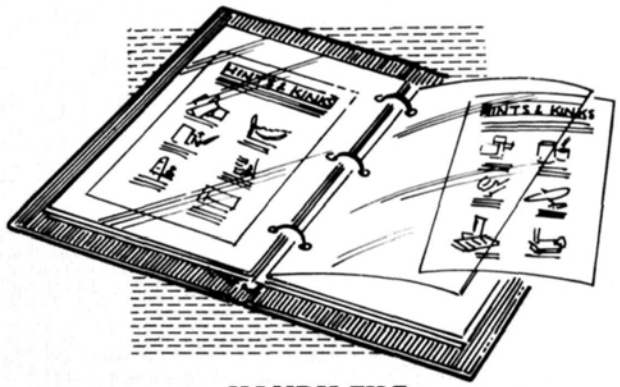
SAFETY FIRST!

Short lengths of wire, when clipped, tend to fly across the shop, or worse, into your eyes. Cut inside a paper cup or, for larger pieces, drape a rag over the cutters.



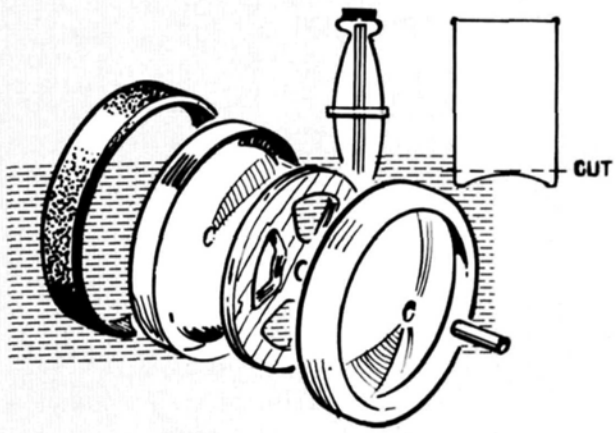
STRIP SPACERS

Equal length spacers: with the aid of a T-square, cut a piece of sheet balsa to the proper length, then strip spacers from it.



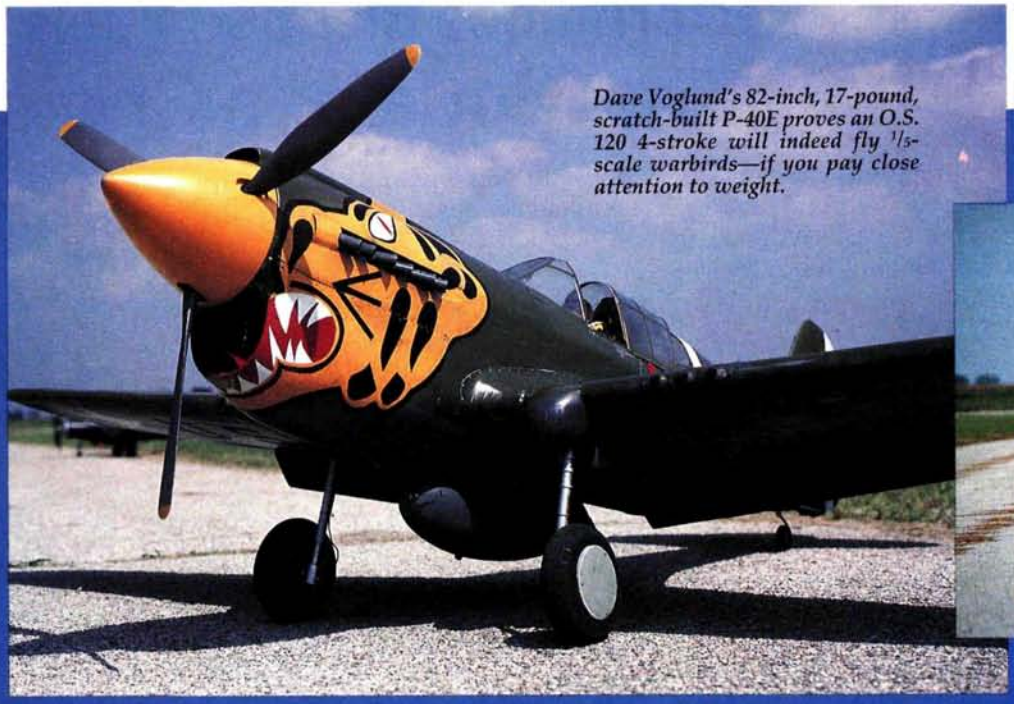
HANDY FILE

In a ring binder, file "Hints & Kinks" pages in clear plastic covers to keep them in good condition in your shop. Why not number the pages and prepare your own index with headings like Construction Techniques, Workshop Practices, etc., giving a brief description under each.



RACING WHEEL

You can make an inexpensive, lightweight racing wheel from two soda-can bottoms, a plywood disc and a 2 1/2-inch-diameter vacuum-cleaner belt. Epoxy a metal tube bushing through the assembly.



Dave Voglund's 82-inch, 17-pound, scratch-built P-40E proves an O.S. 120 4-stroke will indeed fly 1/5-scale warbirds—if you pay close attention to weight.

For all you tail fans: Brian O'Meara's Platt P-51 heads down the tarmac, tail up, right rudder and full power!

The 10th was a "10"! Jets abounded, and the best of the best dueled it out!

UNITED STATES SCALE MASTERS CHAMPIONSHIP

by FRANK TIANO

THE SEPTEMBER '89 U.S. Scale Masters turned out to be the most interesting ever. There were many good things and just a few bad things associated with this year's competition, but fortunately, the Masters Committee is fully aware of the problems, and next year's event should be just about perfect.

This was the 10th anniversary of Harris Lee's brainchild, and it was hosted by the very capable St. Louis R/C Flying Association. Although St. Louis is a wonderful part of the country, it is *not* known for predictable

PHOTOS BY AL FERNANDEZ, MIKE RICHARDSON & CLIFF CHRISTENSEN

Jeff Micko's 22-pound P-47 strikes a realistic pose with its Super Tigre 3000 power, flaps, bomb drop and sliding canopy.

Blow up a set of Royal 60-size Corrair plans and this is what you get. At 22 pounds, Corwin Miller's 75-inch FG-1D looks really good!

It's really mind-blowing that, out of the 73 top scorers, 28 received scores of more than 95 points!

Scott Foster's 38-pound, 10-foot, B-17 Fire Fighter just about stole the show. Four O.S. .45 FSR 2-strokes fly this modified Westcraft kit really well.

Roy Vaillancourt's Hurricane uses a Kioritz 2.4-cuber to pull its 93-inch, 23-pound airframe around.

weather, and this year's contest came really close to being a blowout!

Every major modeling magazine was represented, as well as half a dozen videotape companies; this was good for sponsors and *great* for pilots. Static judging was completed in less than two days, but it was held in the rear parking area of the headquarters motel under less-than-ideal circumstances in somewhat foul weather. Because of the cramped conditions, there was nowhere for the photographers to get good, clean, *realistic* pictures of the models when they were all decked out with their scale props, awesome ordnance and other static goodies. Unfortunately, most modelers didn't bring these items to the flying field during the next couple of days, so many lost the opportunity for some great static photos.

UNJUST JUDGING?

No one has control over the weather, so it's nobody's fault that two of the four days offered much less-than-ideal conditions for the static judging. The cold drizzle and otherwise adverse weather may have prompted what's probably the most controversial set of static scores ever to come out of a Masters final. For example, of the 73 aircraft in static, 62 received scores of 90 or more; 51 received scores of 92 or better; and 36 earned a 94 or more. It's really mind-blowing that, out of the 73 top scorers, 28 received scores of more than 95 points!

Now, I'm *not* saying that there weren't some high-quality models at this event, but the Masters Board's decision a few years ago to throw out AMA Rule 4.6 has turned this into a flying contest. The results speak for themselves! There were some exquisite models, but there were also some highly prefabricated kits that had no business getting some of the static scores that they received. Believe it or not, I've never thought that a scratch-built airplane deserved any better score or any

This airplane almost won the Masters...twice! Bill Miller's 5th-place Royal DC-3 uses a Jomar syn system for reliability, weighs 10.5 pounds, has an 84-inch span and carries two O.S. .40 FSR engines.

Chuck Fuller just never stops impressing us. His Ziroli T-6 grabbed 12th place. Excellent simulation of a metal-clad aircraft!

A very proud Tom Kosewski and his 88-inch, 30-pound, scratch-built Fokker D-VII that earned high static at the '88 Masters. Super Tigre 3000 flies it very realistically.

favoritism over a kit-built airplane, but some of these prefabricated aircraft just *didn't* deserve the scores they received.

THRILLS AND SPILLS

Throughout the contest, many pilots took the lead for a short time, but Bob Fiorenze emerged as the winner (see sidebar). Granted, some led because they had outstanding static scores coupled with fair flight scores, but some short-term leaders were there because of *great* flight scores. Hal Parenti was one of these, as were Diego Lopez and Bill Miller. For a while, many wondered how Diego could possibly *not* win this contest! He had a 97.50 static score, and we all know the guy can fly like crazy, so we figured 1st place was captured and the real fight would be for 2nd through 10th. Well, we were *wrong!*

Bill Miller and his little Royal DC-3, built from a stock kit, combined a 95 static with some really smooth flying, and he seesawed his way between the first two places throughout most of the first three rounds. Bill Carper, flying a Bert Baker T'Bolt, was silently hanging in there, too. Chuck Fuller kept sneaking around, as did Corvin Miller, Bob Hanft and Mark Harrell.

Diego nearly took Mark's fabulous J-3 Cub out of contention by broadsiding it in the middle of the runway. It seems that Diego was screaming down the runway and simply didn't see the Cub's tail section jutting out from Mark's judging bow. In three seconds, the J-3 became a J-2½! A lot of Zap and determination brought the J-3 back for the final round on Sunday!

When you attend a contest of this caliber, you expect to see some really great airplanes. With 73 entries, at least half should be something you haven't seen before, and that's exactly how it worked out. A number of pilots were competing for the first time. As you can imagine, there just isn't enough space to mention every aircraft, but there was enough new stuff to make things really interesting!

Claude McCullough was there with his tricycle-geared Waco, and he had the highest overall static (a whopping 98). Unfortunately, mechanical problems kept him from flying all but the second round and, on that round, all he could muster was a 30 flight score.

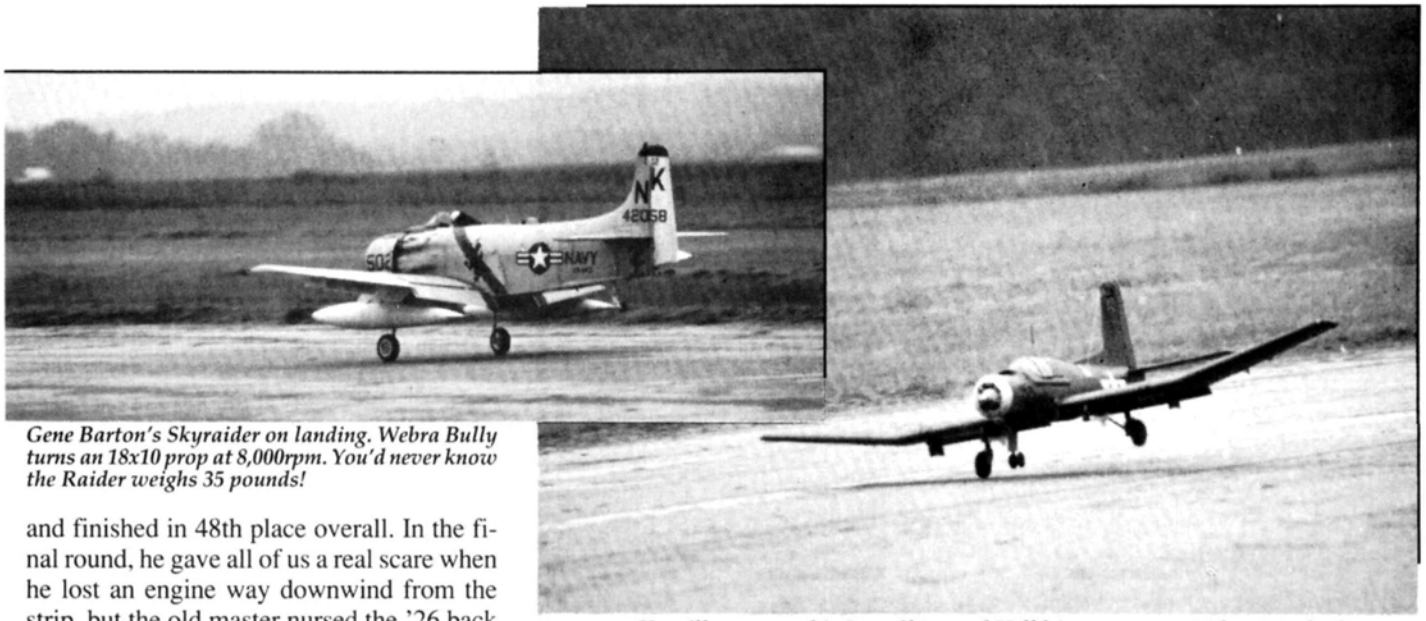
It certainly was a treat to see Chuck Fuller's AT-6—a Ziroli design kitted by Hangar One—with an aluminum finish that was as realistic as you'll ever see. The airplane that stole my heart—and almost the entire show!—was Gene Barton's fantastic Douglas Skyraider. This Rick Lewis design had folding wings, nav lights, exact-scale retracts, special flaps, sliding canopy, tail hook, dive brakes, scale wheels, tilt wheel and cruise control! This is one prop job that can show up any jet once the bugs have been worked out!

Winner of the Best Civilian Award was Jim Terrell, with his stunning Short Skyvan. Jim had a 96.5 static score, but lost the ship during round 1. Art Johnson finally got his stuff together with his big B-26, and eventually earned a 95 static

ONE MAN; ONE ENGINE... VIOLETT VICTORY!

THIS particular contest eventually became a *flying* competition, and the best pilot won: Bob Violett is a master of perfection on those sticks. There's no room for the word "error" in his vocabulary, and he dispelled the myth that, to win the Masters, you need a twin-engine, fire-breathing monster jet with all kinds of trick doodads. Nope! Bob won this contest the old-fashioned way: he *earned* it!

Bob combined a static score of 95 with some superb flying (a 94 average), and he did it with a single-engine, average-size airplane. His options included straight inverted flight, a slow roll, outstanding victory roll, and sequencing retracting gear and ferry tank jettison. Yup—one engine, 12 pounds, a span of only 58 inches and a great performance. *That's* what won it!



Gene Barton's Skyraider on landing. Webra Bully turns an 18x10 prop at 8,000rpm. You'd never know the Raider weighs 35 pounds!

Lawrence Harville executes his Joev Chitwood Helldriver maneuver! The 70-inch Skypirate spans 70 inches but weighs only 13.5 pounds; it took 41st place.

and finished in 48th place overall. In the final round, he gave all of us a real scare when he lost an engine way downwind from the strip, but the old master nursed the '26 back and made a pretty respectable landing only 10 feet from the paved portion of the runway!

Shailesh Patel campaigned his new Tom Cook F-4 Phantom in a spectacular red-white-and-blue paint scheme. Unfortunately, Shay's 95 static couldn't help his sub-par flight scores; he finished in 60th place, but he went home with a whole airplane! Jack Dorman and Wild Bill McCallie (both from Florida) campaigned a pair of new 80-inch P-40 Warhawks. They had their share of teething problems, but you could just tell that, as soon as the problems are worked out, these will be *very* competitive machines.

Possibly the most unusual aircraft was the XTB2D-1 Skypirate belonging to Lawrence Harville—a loveable, almost certifiable, whacko from Texas! Larry fought off a static score of 89.5 and climbed all the way to 41st place with the big torpedo bomber. That meant beating the likes of Brian O'Meara, Bob Underwood, Bill Harris, Shane Cramer, Gerry Fingler, John Guenther, Tom Cook and Kent Walters!

Thirty flights received scores of 90 or better, and, if my records are correct, Chuck Fuller flew the highest flight score of the four rounds with a 97. Considering the number of entrants, mishaps were really few—only seven major crashes, none of them owing to radio failure. The major causes of crashes were engine failures and pilots getting

Above: A man and his bird! Corvin Miller finished 9th with his fabulous Corsair. First flown in September '86, the plane now has 82 flights.

Left: Jack Buckley poses with his CAP 10B prototype from Yellow Aircraft. This O.S. 120 Surpass-powered beauty finished in 20th place.

SCALE MASTERS

their feet switched in the sun!

CLUB CONGRATULATIONS

The St. Louis R/C Flying Association was one of the nicest, most hard-working group you could ever hope to have hosting a contest of this magnitude. When the CD, Charlie Baker, became familiar with Masters procedures, the contest ran along at a good clip. As good as the host club was, I really don't think they could have pulled it off quite as successfully if they hadn't had the help of the Spirits of St. Louis R/C Flying Club. Many of this club's members are seasoned Masters and Top Gun veterans, and I'm sure they had a lot of input on the '89 Masters. Together, these clubs pulled off a successful four-day meet.

SPECIAL SPONSORS

Represented by Herschel Worthy, Pacer Technology once again donated lots of bucks to the Masters committee to be used directly for the operation of the contest and perks for the contestants. I understand that the figure for the '89 event was more than $15,000! You'll never meet a nicer person than Herschel Worthy, and I understand that he's already discussing next year's plan with Harris Lee.

A few other manufacturers followed Pacer's lead and donated substantial amounts of merchandise to the Masters program. These great companies include: Ace R/C, Airtronics, Futaba, Hobby Lobby, McDonnell Corp., McDonnell Douglas R/C Club, RAm Electronics and Yellow Aircraft. I applaud all of these, and I hope that their policies will allow further involvement in future programs like the Masters!

SOME FINAL THOUGHTS

Along with his fabulous 1st-place trophy and the bragging rights that go with it, Bob Violett received a Yellow Aircraft F-18 Hornet ducted-fan kit. In fact, Yellow generously awarded several large—and rather expensive—kits, but none was won by Yellow Aircraft team members!

Of the four gorgeous jets, only Bob Fiorenze's finished in the top 10; he grabbed 7th place with his immaculate F-18 Hornet. Bill Harris couldn't overcome his F-15's drastic pitching problem; and Charlie Chambers couldn't get the engines sorted out in his beautiful F-18,

(Continued on page 72)

QUIET FLIGHT

Project Sophisticated Lady...the kickoff!

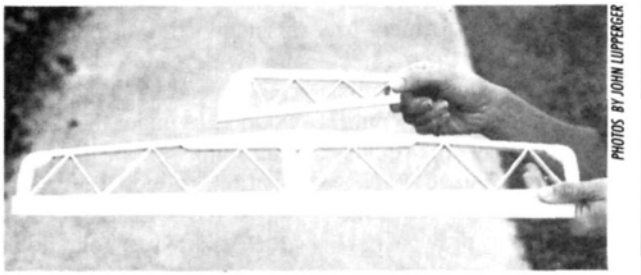
by JOHN LUPPERGER

AS THE EIGHTIES COME to a close, I wonder where our wonderful hobby is headed. Many changes are taking place; the public seems to be becoming more aware of our activities. Sometimes this is good: more attention is being paid to major events, especially those that raise money for a charity or other good causes; sometimes it's bad, as when someone complains about noise or unauthorized flying on public or private property. The use of R/C models in scientific research, for military purposes and for creating special effects in movies make people more aware that the radio-control hobby is something more than "playing with expensive toys."

The hobby industry is changing so rapidly that it's difficult to report on the advancements quickly enough for them to be "news." Many of these major advancements are directly associated with "quiet flight." The first true computer radios were designed for sailplanes. Most aerodynamics advances come from wind-tunnel studies of low-Reynolds-number airfoils, which are used on gliders and electrics. The advancements in electric flight have been so "shocking," that it has truly become a viable alternative to internal-combustion power. Yes, the '90s promise to be very exciting for the devotees of quiet flight!

PROJECT SOPHISTICATED LADY

If you've decided to try Project Sophisticated Lady, read the directions and become familiar with its construction. This month, I'll start with the fuselage and the tail surfaces, and I'll finish next time with the wing. The modifications are primarily designed to make this Goldberg* model structurally stronger. The model flies extremely well, but it does have some areas that can't withstand the abuse that's part of learning to be a better pilot.



PHOTOS BY JOHN LUPPERGER

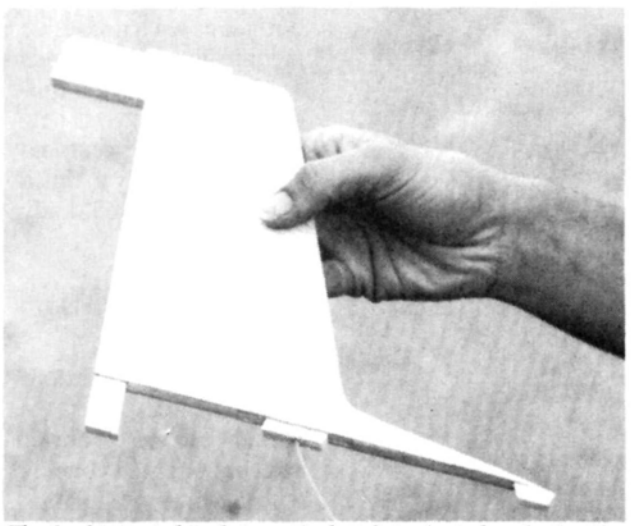
BEC switches and speed controls. From left to right: Union Models power switch (manufactured by KO Propo), KO Propo PX-2 speed control, JR Power Switch 20 and Futaba MCR-4A. Units are all relatively small and very light.

Start by building the horizontal stabilizer and the vertical fin exactly according to the plans. The first modification will be to the finished vertical, which has a habit of breaking at the top when the model lands hard.

Use a piece of medium-weight 1/32x4-inch balsa sheet to completely sheet the vertical fin on both sides. Be sure to run the grain at 45 degrees to the vertical, and in opposite directions on each side. Finally, cut the top and bottom flush, so that the alignment tabs on both remain 3/16 inch thick. This way, the stab will still fit on the vertical, and the vertical will still fit in the die-cut fuselage top sheeting. After cutting out the sheet for both sides, glue it into place with Slow Zap*. Build the rudder according to the plans, and sand all the parts.

Skip to part III of the instructions, and start constructing the fuselage. Because you'll add 1/4-inch triangle-stock stringers, first cut an additional 1/8 inch off the fuselage doublers on the top and bottom areas behind the wing saddle. Follow the steps in the instructions for laying up the two fuselage sides, but substitute 1/4-inch triangle stock for the bottom

The Sophisticated Lady's nose block is shortened by 1 inch, and nose radius is increased to conform with AMA safety regulations.



The Sophisticated Lady's vertical stab is sheeted on both sides with 1/32-inch balsa sheet. Note diagonal grain direction; the other side is done in the opposite direction. Don't sheet the alignment tabs on top and bottom.

QUIET FLIGHT

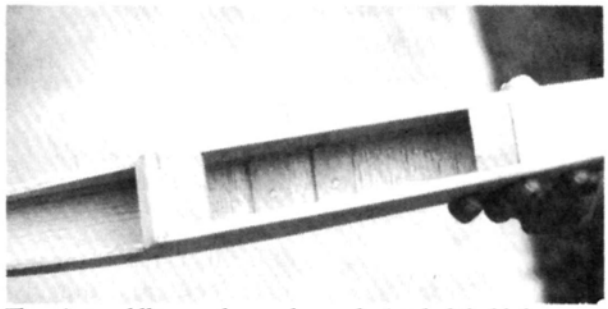
1/8-inch-square stringer and the top, rear stringer.

Proceed until you get to the bulkheads. At this point, make diagonal cuts across the bottom of the front and rear formers to allow room for the triangle stock. Continue with the stock construction until you're ready to rough-shape the fuselage.

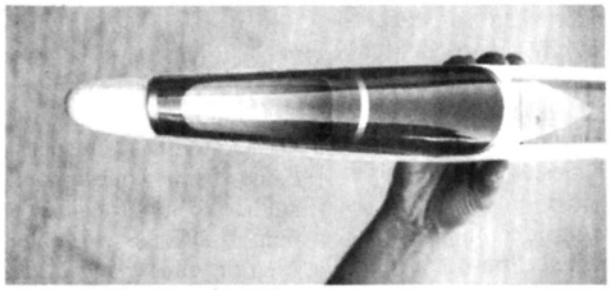
Next, to increase the nose radius, draw a new curve to the outside outline of the nose block, approximately 1 inch back from the front. (The stock nose radius is actually too sharp to meet the AMA safety regulations.) Build the canopy tray as the instructions tell you to, and decide whether you want to include the pilot figure. I decided to leave mine out (it didn't fit the canopy tray very well), and I covered the canopy tray with wet-and-dry sandpaper before gluing the canopy into place.

The next modification is to substitute a bolt-on wing attachment for the rubber bands. Cut a piece of 1/4-inch plywood to fit between the fuselage sides at the rear of the wing-saddle opening. Cut a piece of 1/8-inch plywood to fit under the 1/8x1/4-inch wing rest in the same position. Glue this piece under the wing rest, then glue the wing-bolt hold-down plywood to it. Repeat the procedure at the front of the wing-saddle opening. The wing will be attached with two bolts: one at the front and one at the trailing edge. Fill the rubber-band hold-down holes with Slow Zap or epoxy and microballoons.

If you plan to use the stock tow hook, glue in the two pieces of 1/16-inch plywood for the tow-hook mount. If you want to use an adjustable tow hook (e.g., an Airtronics*orTaylor* unit), mark the position of the bolts to find the center of the hook channel in the location shown on the plans.



The wing-saddle area shows plywood wing-bolt hold-downs at front and rear of opening. Triangle stock and tow-hook mounting plates can be seen in the bottom of the fuselage.



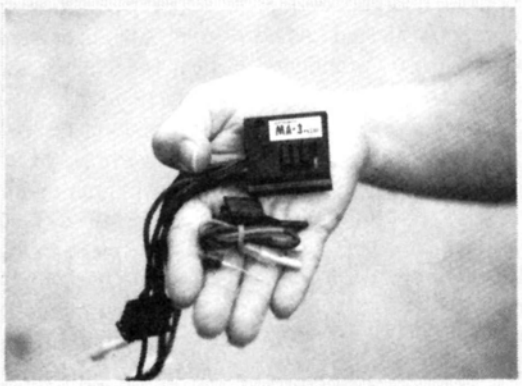
The Sophisticated Lady's blunted nose radius is clearly shown in this shot. Canopy tray is covered with rough-grit, wet-and-dry sandpaper, for a nice, finished look.

Glue one of the 1/16-inch plywood pieces into place to reinforce the area that will be drilled for each mounting bolt. Finish-sand the entire fuselage and round the corners, but not so much that you weaken the structure. If you want to round the fuselage a great deal, use 3/8-inch triangle stock instead of the 1/4-inch stock.

Next month, we'll work on the wings. The modifications will include a double spar with full-depth shear webs, a new dihedral arrangement and spoilers. Be ready to finish your Sophisticated Lady modifications.

AIRTRONICS MA-3

The newest unit to enter this market is the Airtronics MA-3. It's a very small unit, measuring only 7/8x13/8x11/8 inches (including Mosfets). It operates on 4 to 7 cells, and it's rated at 23 amps maximum continuous current (with cooling) with a voltage loss of only .006V per amp. It's fully proportional, with three Mosfets rated at 148 amps maximum continuous current, and 580 amps maximum surge-current capacity. It also has a heat-protector circuit that will shut it down. This prevents the amplifier from overheating because of a high current draw. The unit itself, without connectors, weighs only .63 ounce, and it works with AM and FM radios, but not with PCM models.



Airtronics new MA-3 BEC ESC for 4 to 7 cells. Smallness and lightness makes it great for electric sport flying.

So far, I've only bench-run the unit with a Graupner Speed 500 motor on 6 cells, controlled by an Airtronics 7SP. On the bench, it works as it should, cutting power to the motor after about 41/2 minutes. It doesn't completely cut all motor power, however; there's a small amount of current still available in case a burst of low power is needed during final. As soon as I get it mounted in a plane, I'll report on how it works in flight.

TO BEC, OR NOT TO BEC...

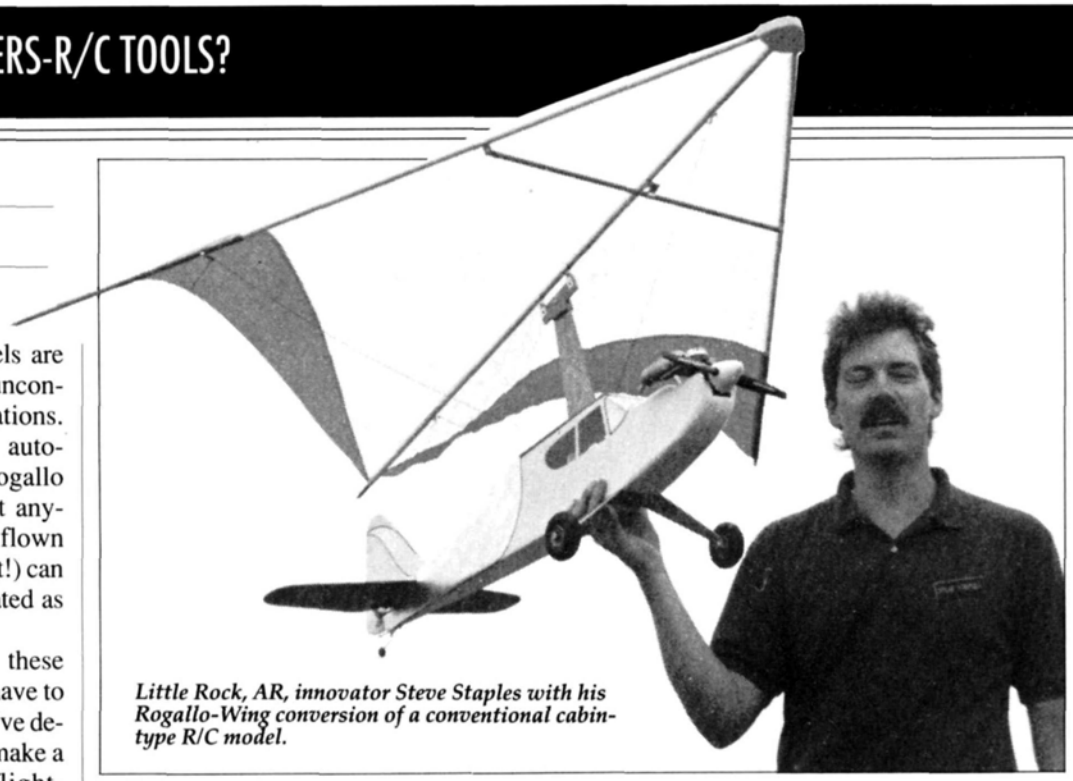
...that is the question! Many electric fliers are hesitant to use power switches or speed controls with a voltage-regulating BEC (battery eliminator circuit). These units have

(Continued on page 73)

SMALL STEPS

CHUCK GLIDERS-R/C TOOLS?

by JOE WAGNER



Little Rock, AR, innovator Steve Staples with his Rogallo-Wing conversion of a conventional cabin-type R/C model.

SMALL R/C models are great for trying unconventional configurations. Flying wings, deltas, autogyros, canards, Rogallo Wings and just about anything that has ever flown (and some that haven't!) can be successfully recreated as small R/C craft.

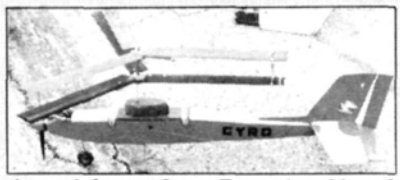
Building one of these small planes doesn't have to be difficult. Once you've decided on the aircraft, make a reduced-size, free-flight-glider profile prototype out of light sheet balsa. With this prototype, you can find the best balance point, determine whether control and/or stabilizing areas are adequate, and establish optimum angular settings of the flying surfaces. You can even perform wing-loading tests. By adding ballast to your profile model you'll be able to determine how much weight the larger version will be able to handle without seriously degrading its flight characteristics. Before you start on an R/C version, you can learn a lot from hand-gliding a small-scale test vehicle.

Another good way of envisioning an unusual R/C model is by reading about other modelers' experiences. This is how Steve Staples came up with his great Rogallo Wing. After reading about a Rogallo in a model magazine, Steve decided to convert one of his high-wing cabin R/C planes into a "flex-winger." Using the magazine's design data for such details as wing shape and center-of-pressure location, he adapted the older design to suit the new configuration he had visualized.

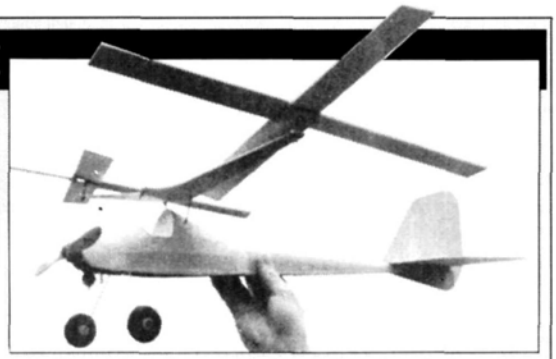
I like to experiment with unusual models. It's fun to venture into the unknown, and with small R/C models, the investment in time and money is quite reasonable. Small, experimental R/C aircraft don't usually sus-

(Continued on page 42)

AUTOGYRO CHALLENGE



A coaxial rotor Gyro. Power is a .20, and the rotor arrangement solves the biggest problem of R/C autogyros. (See text.)

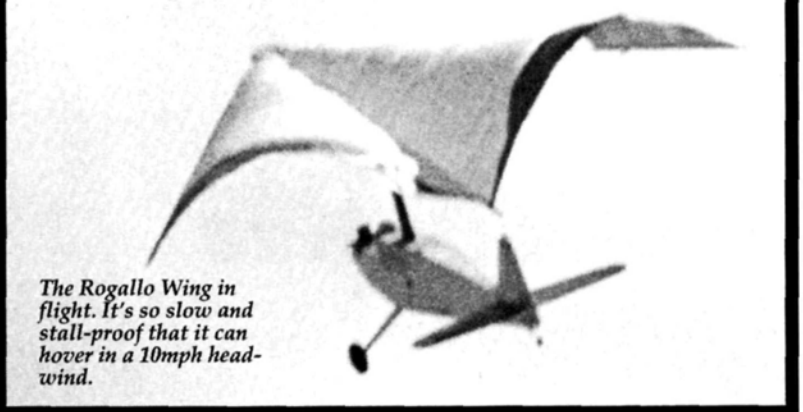


Twin-rotor autogyro by Steve Staples. A Cox .049 provides the power, and despite a somewhat heavy rotor system, it does fly!

GYROPLANES are probably the most difficult kind of R/C model to fly properly. The greatest problem is that, as the rotor blades turn, the blade moving into the wind produces more lift than the one on the opposite side going downwind. This condition varies with every change in the gyroplane's angle of attack, and that's why the only successful R/C autogyros are twin-rotor types. With the rotors spinning in opposite directions, the effects of the adverse blade are cancelled.

So far, no one has figured out how to make a viable flying R/C version of the old-time Cierva, Pitcairn, or Kellett single-rotor gyroplanes. Several have tried (I did!), but as far as I know, the problem is still unsolved.

SMALL STEPS *(Continued from page 40)*



The Rogallo Wing in flight. It's so slow and stall-proof that it can hover in a 10mph headwind.

DELTA DESIGN DETAILS

MANY MODELERS who are familiar with standard airplane configurations wonder how a delta or flying wing can be stable without tail surfaces in the rear to keep it from tumbling end over end.

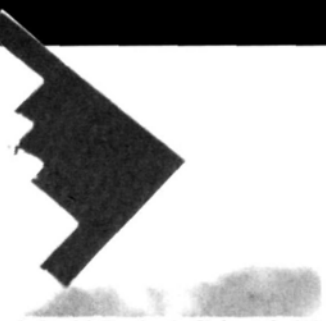
The answer is simple enough: the wing's center of gravity (CG) is set well forward; then enough up-elevon is employed to establish level flight. This produces a clever balancing act, because if a gust makes the wing nose up, flying speed drops and the force on the elevons goes down. This permits the aircraft's inherent "nose-heaviness" to take over and return the plane to its normal flight attitude.

If, however, the flying wing's nose drops, it will pick up speed, and this increases the aerodynamic download on the elevons and re-establishes level flight. When a delta or flying wing is properly set up with the optimum CG and elevon settings, it's as stable as any high-wing monoplane.

As for turning, a delta or flying wing can stall sharply and go into a vicious flat spin if it yaws too much. Aircraft like this are therefore best turned in flight by banking, when elevator action pulls the aircraft around, just as it does in a conventional 2-channel R/C airplane flown with just ailerons and elevators.

tain serious damage in "unplanned landings" because of their low speeds and mass. (If they do crash, they're not too difficult to repair—most of the time!)

Unconventional R/C models are also crowd-pleasers. At model meets, I've often seen wide-eyed spectators—modelers and non-modelers—watching the performances of oddball aircraft. They may not be as exciting to watch as pattern ships, but they always draw a lot of attention. ■



An almost-scale Stealth Bomber in flight at the '89 Dallas Small Fly-In. Only the pusher engine at the tail gives this model away and shows that it's a model rather than a real B-2.

PHOTOS BY JOHN SULLIVAN

View over fun-fly pit area. Race banners and manufacturers' flags addedan air of authenticity.

1989 SCHNEIDER CUP RACE

RE-ENACTMENT

by JOHN SULLIVAN

Team Macchi members discuss last-minute strategy. Super Tiger S-3000-powered 1931 Macchi MC72 hit 67mph.

NO ACCOUNT of the first Schneider re-creation should begin without a few words on getting there. For me and my friend Mike Johnson the journey began at dusk on Wednesday (the day before the race), and ended at dawn with the two of us trying to sign our names legibly at the Nautical Inn's registration desk.

Between sunset and sunrise, we had driven along 300 miles of California's Interstate 5 to Bakersfield and then another 300 miles east over the Tehachapi Range and through the Mohave Desert, with towns like Barstow and Needles and signs like Atom Bomb Road and Borax Road flipping by in the dark.

Lake Havasu's Desert Hawks stage a world-class event

PERFECT PLACE

But what a vision the morning light brought! Lake Havasu, AZ, is a town that didn't exist in 1973. In 1974, someone decided to build a new city, right where the Colorado River widens out. Today, you'll find a brand-new community, with every possible amenity sitting smack between the starkest, most rugged mountain range, and clear, blue Lake Havasu, which stretches as far as you can see.

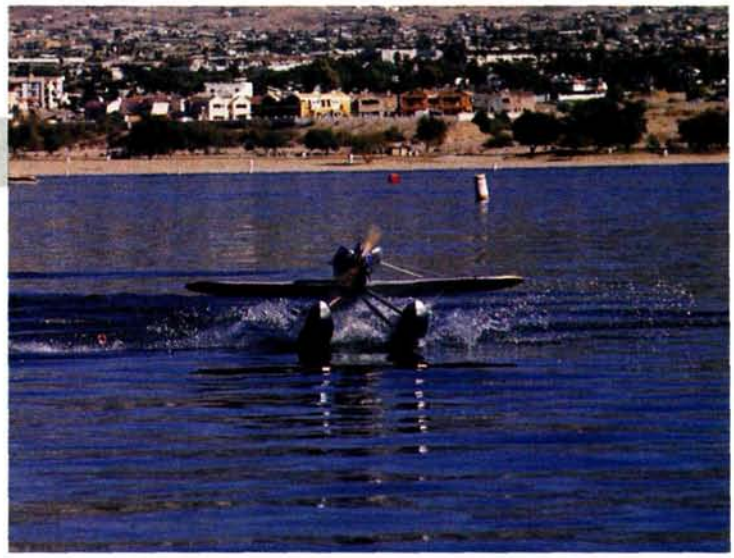
With its clear skies, sandy beaches, gentle breezes, affordable accommodations and temperatures in the low 80s, Lake Havasu City proved to be the perfect oasis for the Schneider Cup Race and an ample reward for the thousands who traveled miles to get there.

The 1989 Schneider meet combined races with a fun fly. Because of an unexpected flood of entries, Bob Martin (event chairman) and the Desert Hawks Club decided to begin the Schneider competition one day early on Thursday, November 9. Both static and speed trials were set for that day, and with static accounting for 50 percent of the total score and scale speed accounting for 25 percent, there was much to be gained (or lost) in the first few hours of the meet.

STATIC

The static event was the most astounding display of craftsmanship that I had ever seen. Judging took place at the Nautical Inn Convention Hall, and the entire process was open to the public. Early birds saw all 21 of the giant-scale entrants carried in (in pieces) and painstakingly assembled.

Engines selected for the racers ranged from custom, 4-cylinder, 4-stroke to piped, in-line Super Tigre Twins, to earth-shaking Zenoah G62s and a few stock selections on the early racers. The finish on practically all of the entries was nothing less than mold quality, and the hatches dropped into place with the reassuring click of a Rolls-Royce glove box. During the following three days, I realized that any one of the events—static, speed, or

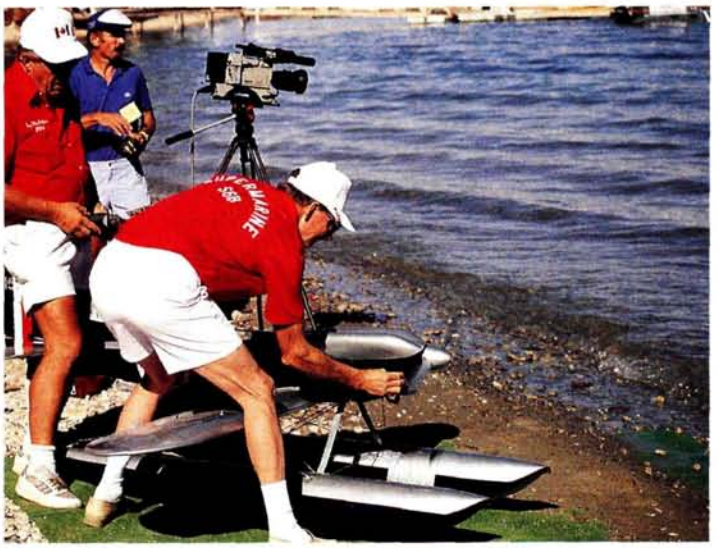


A Supermarine S6B returns from a heat race. Lake Havasu City in the background.

PIC Adhesives' pit member walks the company's 1/3-scale Curtiss R3C-2 back from a run. Plane clocked 76.3mph for a 1-percent error in the speed run.

Supermarine S5 ready for release.

Don't do this! Pit-crew member brings Ken Bundt's Supermarine to a halt.



Team jackets and shirts make a nice touch. Doug MacMillan and Bob Bently tune their Sachs Dolmer 4.2. Note bandaged float.

Jerry Holcomb's 1929 Macchi M52R at rest. Super Tigre ST6000 power.

A 1927 Supermarine S5 breaks the water. Arizona mountains in the background.

Dick Skogland's 1913 Duperdussin taxis out for speed trials. Plane featured authentic wing warping for control. Enya 1.2 4-stroke power.

the four heats around the pylons—was worth the trip. This was a superb show.

Judging for static was based on stand-off scale rules, and models were viewed from 15 feet. Standards were strict, but consistent, and entirely acceptable for an event of this stature. Bob Hirsch and Warren Olson put these people through the wringer, and I would have hated to be on either side of the rollers.

When it was all over, six models had scored in the 80s, 10 in the 70s, and two in the 50s and 60s. Three couldn't make the deadline or pulled out. Robert Heitkamp's 1927 Supermarine S.5 came out on top with 34 out of 40 points for accuracy, 26 out of 30 for craftsmanship and 26 out of 30 for finish, for a total of 86 out of a possible 100 points.

SPEED TRIALS

After all the models had undergone static judging, they were transported for the speed trials (along with team members and support equipment) to a site just north of the Nautical Inn's Sailboat Cove. Frank Kelly of the Desert Hawks Club had devised a computer program to catalogue entrants and chart static, speed and heat events. When entrants reached the speed site, they were given a target speed to attain through the traps based on their models' scale relationship to their full-size counterparts.

The read-out gave scale prototype mph, target mph, time in seconds, measured mph and percentage of error. Frank had also set up timing stations that used non-flying band equipment to transmit data directly to the computer station. Immediately after a run, walkie-talkies were used to relay information from the computer. In most cases, the pilot knew his speed and error percentage before the plane was 100 feet out of the traps. Each pilot was given three shots at an upwind/downwind run and was allowed to select the best one for scoring.

Six of the 21 pilots came within 4 percent of actual scale speed! Ken

Bundt, who was flying a 1/4-scale 1931 Supermarine S.6B powered by a ST6000 Twin, nailed and set his speed at 84.3mph, which was less than 1 percent off and the fastest time of the day! I had thought that some of the later, faster ships wouldn't do well in speed, but this wasn't the case. Some of the older entrants *did* have problems, but it didn't matter. For example, Dick Skoglund, who put in one of the best shows at the speed trials, flew a 1913 Duperdussin, which had a target speed of 10.7mph!

Dick used every trick in the book: he flew corner to corner through the traps and just hung on the edge all the way for a very respectable (for a scale model) 22.9mph. Dick had a 113-percent error and zeroed out, but on landing, he received the event's loudest applause. By the end of the speed trials, only seven points separated the top five combined scores. Ken Bundt took the lead with 135; Bob Heitkamp dropped to 2nd place with 133; Paul Schulz's Macchi M52R held 3rd with 132; Ken Merril's Curtiss R3C-2 was in 4th with 129, and Bill Curry's Macchi M.33 held 5th place with 128 points. It was a *long* day!

Eleven of the 21 Schneiders zeroed out in the speed trials because of crashes or equipment failures. That sounds like a lot, but you have to remember that Cosworths and Ferraris blow up in the pits, or scratch out on the track, too, and the comparison between types of speed machines is an apt one.

A GREAT SHOW

The next two days (Friday and Saturday, Nov. 10 and 11) were reserved for four heats, and there was fun-fly activity between the heats. A triangular plyon course was set up directly off the Nautical Inn's main beach, and another double row of buoys paralleled the beach for takeoffs and landings. The racers were judged in five categories: takeoff; adherence to course; altitude; speed and landing, with a 10-point maximum for each category (50 points maximum). After running four heats of 10 laps each, racers averaged their best three for a final score.

The fun fly brought in 148 registered pilots with over 200 floatplanes, and the Nautical Inn's manager estimated the crowd on Saturday to be well over 5,000 people!

At this point, the meet really took on an international flavor. In the pits, ribbons and banners were strung out in a zipper pattern to section off individual pit areas for racers while allowing spectators to move around the perimeters and view each plane—a great idea! Most of the entrants had taken the time to develop team shirts and jackets with country of origin or their plane colors splashed all over.

The combined beach and lawn areas were easily the size of two football fields, and every square foot was needed to accommodate Schneider entrants, fun-fly planes in a separate pit area, over 30 manufacturers' booths, a hamburger stand, transmitter impound, palm trees, folding chairs and people.

The fun fly brought in 148 registered pilots with over 200 floatplanes, and the Nautical Inn's manager estimated the crowd on Saturday to be well over 5,000 people! The Nautical Inn was fully booked in May (six months before the race), and the town's Chamber of Commerce reported that on Saturday night, there were only four rooms left in all of Lake Havasu. Floatplane flying has *definitely* developed into a separate and distinct activity within the modeling community.

Back to the race. At the beginning of the heats, 12 out of 21 Schneiders were still running. There were favorites, but it

(Continued on page 48)

SCHNEIDER CUP

was still anyone's game with four heats of 10 laps each spread over two days. Depending on frequency separation, as many as four planes at a time were allowed in the air, and spectators were able to see some real racing. It took a little sorting out and coordination between spotter and pilot, but usually by the second or third lap, the racers were tight on the course, diving into turns and screaming and whipping knife-edges around the pylons. I can't tell you how exciting it was to see racers battling tip to tip again after an absence of 57 years. Bob Heitkamp's Supermarine S.5 and Frank Schoening's 1914 Sopworth Tabloid each took 43 out of 50 points in the first heat with Cliff Adams, Ken Bundt,

Bill Curry, Larry Botsford and Ken Merril right behind them, and they all scored in the 40s. The second heat on Friday afternoon started with a bang. Most of the pilots took 9s and 10s in each category, with a few 8s and nary a 7.

Then tragedy struck. In the only mix-up of the entire four-day event, Bill Curry's beautiful Macchi M.33 went in wide open when an identical frequency was issued to the next pilot up on Bill's station. Bill flies a Laser in full-scale I.A.C., and he's no stranger to the ups and downs of competition. The Hawks handled the incident fairly by giving Bill duplicate scores for his first heat, and this ultimately put Bill in 4th place. I sure miss the days when each transmitter had two colored ribbons out on the tip of its antenna instead of today's red ribbon with two (usually undistinguishable) numbers swiveling around the antenna's base. Many times, an aircraft was saved by its pilot glancing around to see if anyone was flying his colors.

Friday ended with fun flying until dusk. The Desert Hawks had a large bulletin board erected at the transmitter-impound stand, and this displayed the line-up for each of the stations. This allowed the fun fliers to prep their planes prior to their call, and many flights took place in the time allowed. Mike Johnson wowed the crowds with his 1/4-scale, 96-inch Gee Bee R2100. It was powered by a Zenoah G62, and he flew it *on floats* in front of a wall of video and still cameras. The Gee Bee had only been flown twice before the meet. Mike was shaking, but he still managed to grease a landing that had the steps slicing the water for 50 feet. Great show!

On Saturday morning, there were two heats left, and with final scores based on the average of a pilot's best three, everything was still up for grabs. Ten planes made the third heat; eight placed in the 40s and two others fell back. Dick Skogland's Duperdussin,

(Continued on page 76)

BUILDING
MODEL AIRPLANES

Through the looking glass: windshields made easy

by JOE WAGNER

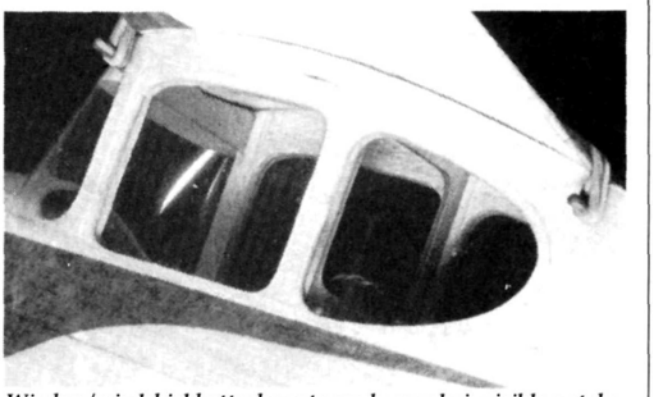
I LIKE THE LOOK of transparent windshields and windows on enclosed-cabin R/C models. They add realism, and they let you see what your servos are doing. They're also light and easy to install.

There are a few tricks, however, to achieving neat, clean, firmly attached windshields and windows. First, you need the right material. Most transparent plastics are adversely affected by glow fuel, so unless you're building an electric- or diesel-powered airplane, use only cellulose acetate butyrate (CAB) plastic sheet. Available from Sig*, it comes in .008, .015, .030, and .040 thicknesses and two sheet sizes: 8 1/2x17 inches and 17 inches square.

The thick material is great for heat-forming bubble canopies, but isn't necessary for windshields or cabin windows. The .015 works well for models up to the size of Sig's Kadet Senior, and .008 is all I use for 1/2A R/C planes. The thinner material is easier to work with and looks neater on the model.

Flat cabin windows are easy to make and install. First, cover and finish the model's fuselage, window openings and all. Then, mark each individual "pane" with paint or a felt-tip pen so you can identify its exact position later.

Next, cut the window openings with a sharp no. 11 X-Acto. Cut precisely along the edges (using a slicing action) to produce smooth-contoured "patterns" and glue them onto the plastic sheet with artists' rubber cement. For the easiest and neatest installation, keep everything free of smudges and dust.



Window/windshield attachments can be nearly invisible, yet durable. This frequently flown, 12-year-old model hasn't lost a window yet!

After the rubber cement has dried, carefully cut out each plastic pane, approximately 1/32 to 1/16 inch outside the pattern outline. Barbers' shears work very well for this, and any crooked edge can be sanded to the outline with fine sandpaper. Attaching the windows to the model is easy—but don't remove the glued-on patterns yet! They make accurate positioning easy and protect the transparent plastic from scratches and glue smears. Align each pane so its pattern exactly covers the hole it came out of, and anchor in place with narrow strips of masking tape.

When all the windows have been taped into position, carefully apply a thin line of glue around the perimeter, between the tape strips. I prefer Wilhold's RC-56 or PIC's Flex-White glue for this job. They're water-based, easy to apply with a fine-point watercolor brush, and they make strong, almost invisible

The good old Handi-Bender hasn't changed, although it's now made in Japan under a different name. Underneath is Micro-Mark's catalogue, which lists a treasure-trove of modeler's tools!

EASING THE BENDS

IN A PREVIOUS COLUMN, I mentioned a tool for bending wire and strip metal called the Handi-Bender, which, as Bob DeMond of Panama City, FL, kindly pointed out, isn't as easy to find as it was a few years ago. There's good news, however. Bob tells me that Micro-Mark* now carries a Japanese-made version that costs about $4.50. This Wire-Bending Jig is very useful for bending wire and forming sheet-metal strip for cowl brackets and similar fittings that may not be commercially available.

Micro-Mark sells a fantastic array of modeling tools, many at discount prices. The company carries precision, miniaturized versions of just about every wood- and metal-working tool there is—too many for me to even begin to list here! Why not send for their catalogue?

*Here's the address of the company mentioned:
Micro-Mark, 340 Snyder Ave., Berkeley Heights, NJ 07922. ■

BUILDING MODEL AIRPLANES

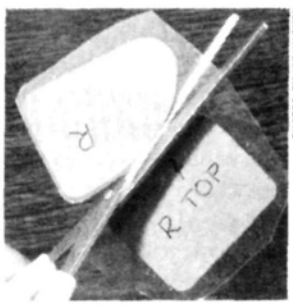
bonds. If you're careful and steady-handed, CAs can also be used.

When the glue is thoroughly hardened, gently remove the tape strips and apply adhesive to those areas. When all the bonds have cured, carefully peel away the patterns and rub off any remaining rubber cement to reveal a set of beautifully transparent cabin windows!

Because of their curvature, windshields are more bothersome to make and attach. Fitting has to be done by trial and error, but make the errors with paper instead of plastic! Once you have a paper pattern that fits perfectly, it can be rubber-cemented to the plastic, which is then cut out and glued to the model as for flat windows.

One problem with CAB plastic sheet is that it's rather stiff and springy. If you "cold-bend" a curved windscreen and attach it to your model, chances are it will spring loose at an edge or corner. That's why it's best to pre-form model windshields so they fit into place without much forcing.

Strips of tape hold the window flat against the fuselage while you apply glue with a no. 00 brush. White glue like RC-56 works well and won't seep under the tape.



PHOTOS BY JOE WAGNER

Cut approximately 1/16 inch outside the edges of the window pattern. Sharp shears make this job quick and precise.

This bent-to-shape windshield is firmly attached, but the RC-56 glue line can't be seen. (The framing is faked with Magic Mending Tape painted aluminum.)

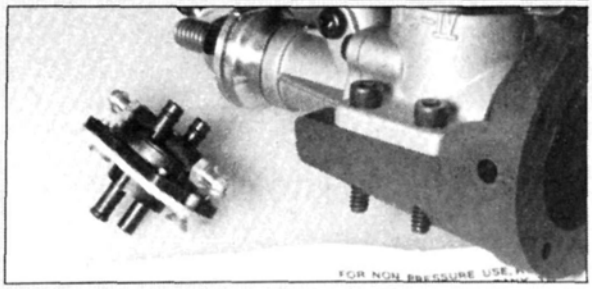
This can be done fairly accurately by hand. Soften the plastic by dipping it into very hot water; then bend it until it fits nicely over the front of your model's cabin. The plastic can be reheated and re-formed as often as necessary. An alternative is to cut your windshields from transparent plastic soda bottles. They're pre-curved, fuelproof and can be hand-formed in the same way.

Windshields for open-cockpit R/C airplanes can be made and attached in the same way as those for cabin models, but should be made from thicker plastic because they're more exposed. For a scale-type windshield with three or four flat panels, cut a one-piece plastic blank, heat it in hot water and fold it to the shape you need, using the edge of a piece of hardwood as a bending guide.

Remember that the preliminary steps of making a windshield—cutting to shape, heating, bending and attaching to the airplane—are all done with the paper pattern still rubber-cemented to the plastic. This technique makes the windshield easier to handle and protects it from damage during construction.

**Here's the address of the company mentioned in this article:*
Sig Manufacturing Co., Inc., *401-7 S Front St., Montezuma, IA 50171.* ■

PLUMBER'S HELPER



The miniature size of Argo-USA's refueling manifold is obvious next to an Enya .15. The unit isn't much bigger than the motor's mounting screws!

THE MOST USEFUL model-engine accessory I've seen in a long time is Argo-USA's* ingenious Refueling Manifold and Shutoff Valve. The name is bigger than the product, which weighs less than a quarter of an ounce and fits into a 1/2-inch hole in a model's fuselage!

I wouldn't have thought such a tiny gadget could perform so many functions! It greatly simplifies the "plumbing" installation from tank to engine. Only two tubes are needed in the fuel tank: the pickup line and a vent. If muffler pressure to the tank will be used, the engine requires two tubes. (For "atmospheric venting," all you need at the motor is the fuel-supply tube to the carb.) These lines don't have to be disconnected during fueling or de-fueling.

The three or four plastic tubes from tank and engine connect to fittings on the back of the manifold. Only a pair of 1/8-inch-diameter black plastic "posts" protrudes from the fuselage. One is hollow, for the fueling/de-fueling connection. The other is solid, to allow finger-rotation of the valve from one position to the other, like a car's ignition switch.

The ignition switch comparison is apt, because you can quickly stop the model's engine by turning the Argo valve to its "fueling" position. This immediately shuts off the fuel supply to the carb. You no longer have to perform dangerous manipulations (like pinching the fuel line) near a whirling propeller!

The shutoff feature also prevents engine flooding during fueling. With the "plumbing" many modelers use, pumping fuel into the tank forces some of it out to the carb. This is not only messy, it's also a fire hazard! Not so with Argo-USA's new manifolds! I'll be using these in all my R/C models from now on.

**Here's the address of the company mentioned:*
Argo-USA, *3229 Dianora Dr., Palos Verdes Peninsula, CA 90274.* ■

PROCTOR ENTERPRISES

CURTISS JENNY JN4D

A scale replica kit of the beloved classic that you won't be afraid to fly!

by SAL IASILLI

Melinda, Corinne and the Jenny—all dad's pride and joy.

IMAGINE A PLANE that captures the flavor of the "Waldo Pepper"-type barnstorming that thrilled spectators in the '20s. Engineer Ralph Beck designed and built a model of just such a plane—the famous WW I-era Curtiss Jenny.

He built the prototype with the help of information obtained from the Smithsonian Institution in Washington, D.C., and the Air Force Museum in Dayton, OH. The fruition of three years of research, many trips to four museums and 1,500 hours of designing and drafting, his plans are a work of art! His labor of love continued with 2,500 hours spent on building and testing the prototype Jenny! His full-size plans consist of three 36x72-inch sheets that include every detail. I'm sure they could even be used to restore the *full-scale* Jenny!

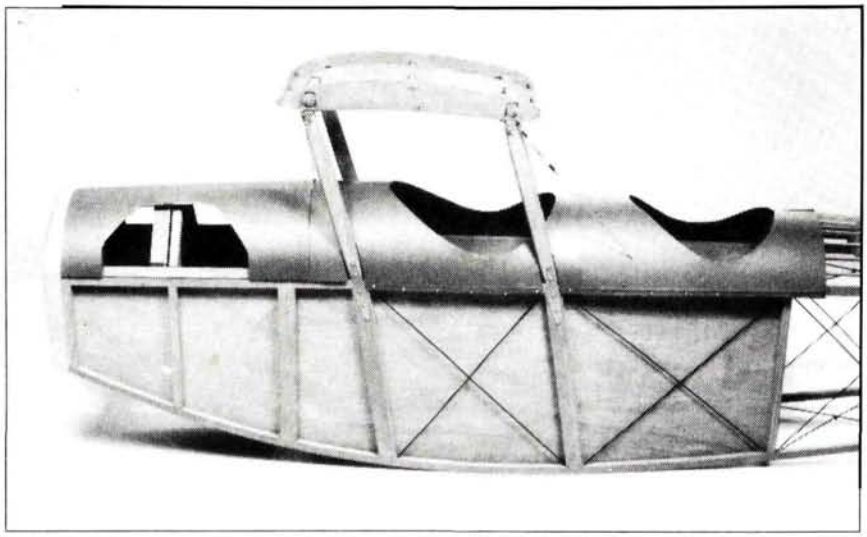
For many years, Lou Proctor* sold a partial kit of the Jenny, but it didn't sell well because most mod-

SPECIFICATIONS

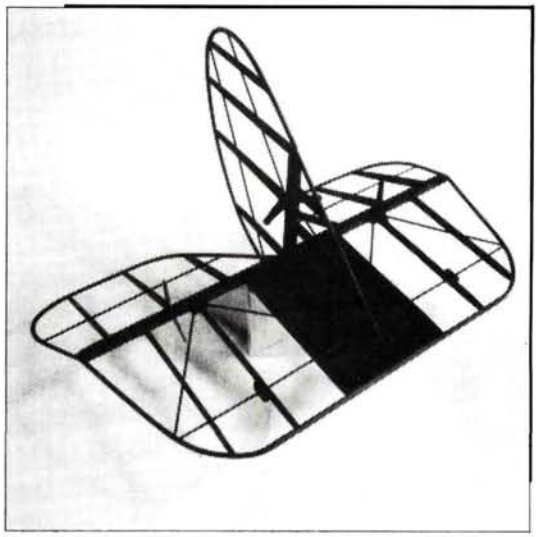
Type: *Curtiss JN4-D2 Jenny*
Span: *87.23 inches (upper); 67.87 inches (lower)*
Weight: *9 to 10.50 pounds*
Length: *54.66 inches*
Height: *19.77 inches*
Power Req'd: *.60 2-stroke; .80 4-stroke*
No. of Channels Req'd: *4 minimum*
Suggested Retail: *$349.95*
Features: *Complete hardware package, including scale cable controls to all surfaces and cable wing rigging. Dummy OX-5 engine and four large sheets of highly detailed plans.*
Comments: *This is a realistic, historically significant biplane that takes surprisingly little time to build. A "gentle-flying" plane and an exceptional kit.*

PHOTOS BY SAL IASILLI and PROCTOR ENTERPRISES

The 17-inch static display prop is a re-shaped 18-inch Zinger. Drawings from the plans were used as a guide.



Very few concessions to scale were made in designing the Jenny kit. Structure approximates full-scale JN-4.



The Jenny's tail feathers before covering.

THE CURTISS JENNY-A GRAND OLD AERO LADY

DEVELOPED IN 1915, the Jenny combined the best features of the Curtiss "J" and "N" models and became the most famous airplane of WW I. A Jenny JN-3 was used during General Pershing's 1916 Punitive Expedition into Mexico, but it was found to be unsuitable for field operations. Modified and released later that year as the JN-4, the Jenny became the mainstay of America's air training program. From April 1917, when America entered the war, until Armistice Day in 1918, more than 6,000 JN-4s (most of them JN4-Ds) saw active service with the Signal Corps.

Most Jennys were used for primary training, but some were used for advanced training and were equipped with machine guns and bomb racks. In the post-war years, hundreds were bought by civilians, and thousands saw the Jenny swoop by at a hair-raising 75mph during "barnstorming" tours in the '20s, when they were used at state fairs for daring exhibitions and for advertising. You can see one of these planes at the Long Island Cradle of Aviation Museum, its fabric covering now obscuring the initials of its one-time owner—"C.A.L." Remember him?—33 hours *solo* to Paris!

Postwar progress brought stringent safety regulations, however, and in 1928, the Jenny was banned from the skies, leaving only a few to be used in the film industry. Today, a surprising number of Jennys are being restored, and six were displayed last year at the Oshkosh, WI, event.

If you'd like to see this beautiful plane up close, you can find them at several museums, and if you're in Ohio, why not visit the Air Force Museum in Dayton. You won't see a better free show anywhere!

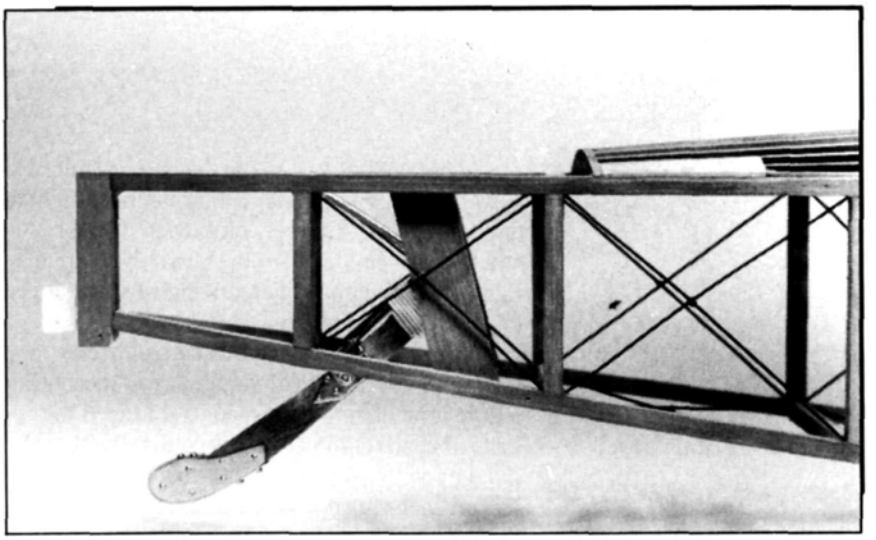
elers preferred a complete kit. When Lou Proctor retired and sold his business to Dick Heininge, one of the company's first projects was the production of a complete Jenny kit, and during the first year, they sold 200.

The kit has as much detail as possible, taking into account that it must be produced economically. Production parameters have required several minor changes from the plans, and these changes are noted in the construction manual parts lists. All the information you need to produce a Jenny that's exactly to scale can be found on the plans.

THE KIT: This authentic scale construction uses balsa, spruce, bamboo, aluminum and brass materials, and there are four large sheets of highly detailed, full-size plans (rolled). The hardware is preformed and pre-assembled; there are cable controls to all surfaces; and the cable wing rigging has working turnbuckles. There's also a great kit of the dummy OX5 engine.

Every assembly step is described in the construction manual, which also contains eight pages of historical information and 46 "start-to-finish" photos. Six pages list and describe the parts and tell you where to find them on the plans. The manual was written while the production model was being built, and Proctor recommends that you follow it exactly.

CONSTRUCTION: Some parts of the airframe should be stained before they're assembled, because areas coated with cement or glue won't accept a stain. For a realistic scale effect, use Proctor's lacquer-based stains; you'll need



Tail-skid detail. Looks and functions like that on the full-scale airplane.

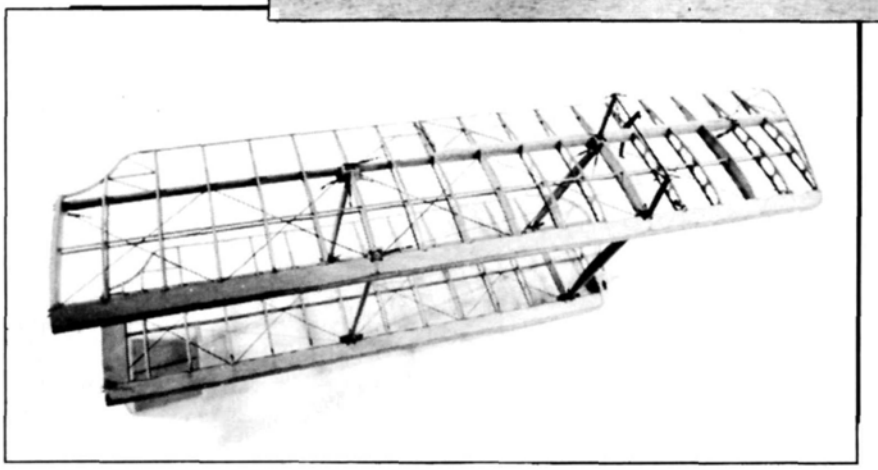
The height of the Enya .80 4-stroke engine necessitated that an opening be made between the OX5 dummy-engine cylinder banks.

Cherry Mahogany (product no. 344) and Light Oak (no. 343) at $3.99 for a half-pint size.

The fuselage consists of a right and left frame that are built directly over the plans. (Use wax paper to protect the plans.) These are then joined to the forward bulkheads, which also support the motor mounts and the rear cross-members. Proper fuselage alignment is accomplished with the use of eight alignment jigs—all clearly shown in the photos. After this, install the bamboo cross-braces in the fuselage and then the rear deck bulkheads and stringers.

In the cockpit, start by gluing the seat rails and assembling the front and rear seats according to the plans; next, install the front and rear instrument panels, but set the seats aside for installation later. Instrument panels are now drilled out to accept instrument housings, and they're then glued into place.

The upper wing's center section (which is technically part of the fuselage structure) is built next. When building it, you'll also have to attach the brass strut fitting according to the plans. Next come the center-section struts, which are secured to the upper wing's center section by no. 33 nuts and bolts. After this, attach the strut fitting to the lower end of the struts, and mount this assembly to the fuselage longeron. (Use the plans as your guide.)

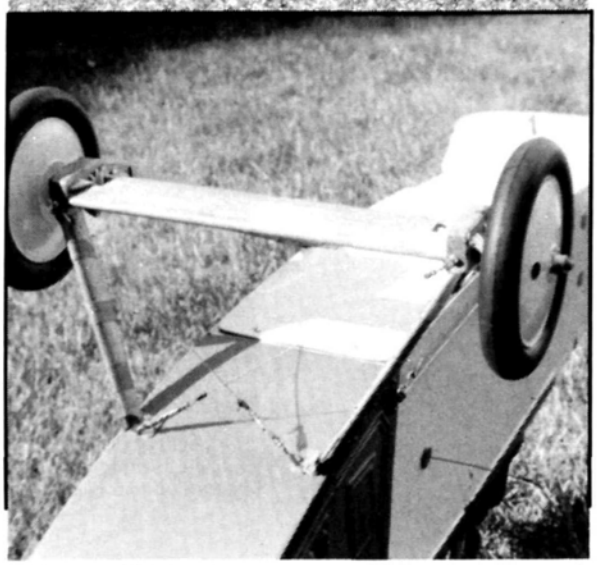


Using the full-size templates on the plans, the cowl skins are made with 1/32-inch ply and thin aluminum sheeting, which are laminated together using photo-mounting spray adhesive. The engine cowl is assembled by fitting the cowl skins to the five bulkheads and stringers.

Before gluing the radiator grill to the hardwood radiator shell and then to the fuselage, a wire outer frame must be soldered around the grill's perimeter. The opening where the engine shaft exits the grill will also need to be strengthened with a wire frame, and this, too, should

be soldered on. (Follow the instructions *very* carefully when aligning this assembly.)

Now assemble the tail skid, which consists of brass skid plates, brass pins and shock cord. These are all assembled to a hardwood tail skid, which functions *exactly* like the full-scale one!



This view of the landing gear reveals the bracing wires and turnbuckles, shock cords, and 4¾-inch Williams antique scale wheels.

The stabilizer, elevator, rudder and vertical fin are all constructed in basically the same way, directly over the plans. Bamboo and reed are used in all Proctor's kits because they're light and flexible.

Now to the most time-consuming part of this project—construction of the wing outer panels. To align the upper and lower capstrips with the main ribs, the wing rib must be built in a jig. When this has been completed, the rest of the wing assembly is fairly conventional and moves along nicely. With Proctor's high-quality instructions, plans and photos, it's easy to understand this part of the assembly, and I enjoyed the task.

At first glance, the Jenny's wing rigging looks like a modeler's worst nightmare, but when you've studied the plans and photos to see where everything goes, you won't find it complicated.

I modified the landing gear so that it was easier to construct. It's made of hardwoods, brass fittings, a spreader bar (which has a steel axle) and a wrapped shock cord like the one used for shock absorption on the full-size Jenny.

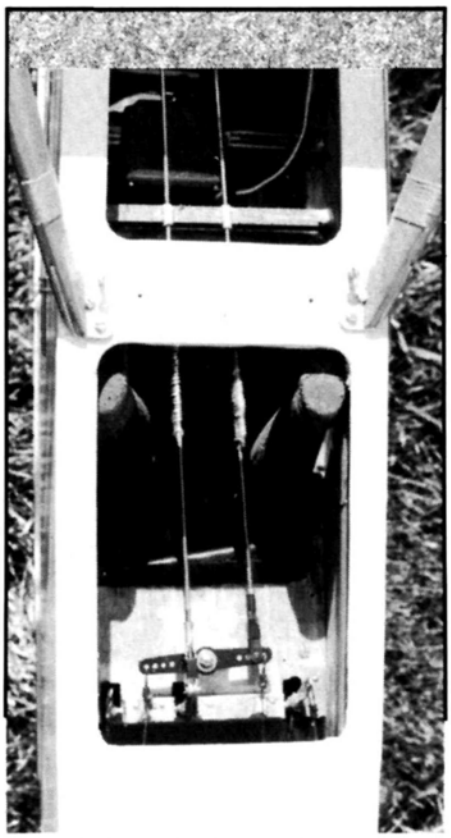
When assembling this kit, my favorite part was putting together the OX5 dummy engine. Even the smallest details are included, and its realism makes it the plane's focal point. The engineering behind putting this part of the kit together must have been quite complicated, but it was well worth it.

With the exception of the cowl skins, the model was covered with antique Colortex*. I also added rib stitching and reinforcement tape to enhance the plane's scale look. To make the rib stitching, I used beige carpet thread, which can be bought at any fabric store. In brief, I followed the rib-stitching spacing and width shown on the plans, lightly marking the covered wing ribs with a pencil and a yardstick.

When the correct locations had all been marked, I cut lengths of carpet thread measuring a little more than a wingspan, and I taped the ends of each (at the wing tip) so that the thread lined up with my markings. I then put a drop of CA on each rib and thread where marked. When this had dried, I cut off the excess thread between each of the ribs. This method makes an excellent simulated rib stitch. I followed this with rib-reinforcing tape, which I made with the Colortex covering, again following the illustrations shown on the plans.

When the covering was complete, I installed the engine side covers. These are of ABS plastic and have all the panel lines and engine vents formed into them. To allow cooling air to circulate around the engine, I carefully cut open each formed vent.

The fabric surfaces were all sprayed with two coats of Perfect Paints* polyurethane Cream, and the cowling and engine side covers were sprayed with two coats of Formula U* Camouflage Tan.



With the lower fuselage hatch removed, the rudder and elevator pushrods leading to the control horns are visible, and so is the aileron servo under the front seat.

Decals aren't provided with this kit because there are so many full-scale schemes after which you can model your Jenny. I needed help with finishing, so I called Vinylwrite*, and I described the type and size of letters and numbers I wanted.

I also had a problem when trying to paint the four 10-inch roundels. No matter how many times I practiced painting on paper, I couldn't get the roundels to look right. When my order came from Vinylwrite, they called to see if I was satisfied. (Now *that's* what I call concern for customer satisfaction!). I assured them I was, and I also mentioned my difficulty in duplicating the roundels. To my surprise, they told me about a recent first order from a Canadian for whom they made a seven-color, 12-inch roundel, and said my three-color, 10-inch roundel would be easy to duplicate. When they arrived, the roundels were exactly what I needed; they even conform beautifully to the rib stitching and reinforcement tape and look as if they were cleverly painted on.

(Continued on page 87)

GOLDEN AGE

OF RADIO CONTROL

by HAL deBOLT

O/T R/C mecca and the digital systems arrive

Sig's Claude McCullough really goes back years. He said fuselage was sized to suit radio equipment used. May have included two systems to get multi control in those pre-reed days. Super Cyke power.

READER NEWS

SADLY, I REPORT the death of Bob Ball of Brantford, Ontario, Canada; he was active in R/C pylon circles, and he became involved in the United Pylon Racing Circuit. With Howard Dart, I introduced this circuit, and Bob was one of the two Canadians who became interested. With his close friend, Al Baker, Bob played an important role in promoting the UPRC as an international circuit, and they made their mark in the competition, too.

During the UPRC's 17 years, Bob was a leader in the Brantford group; he helped organize their annual race and often hosted the UPRC Championship and banquet (which were greatly appreciated by all!). Bob was always a keen competitor, too, and his light-hearted approach to racing always reminded us that it was *supposed* to be fun; the atmosphere was never tense when Bob was around! Over the years, Bob and Al showed that they could turn pylons with the best. The UPRC lost a great man in Howard Dark several years ago, and now another has joined him. All who knew them will feel the loss.

HANGIN' OUT

Seven years ago, I moved to Florida, but I had relatively little idea of what to expect, other than *great* flying weather. I was surprised (and delighted) to find many other OT R/Cers who have made the move south. Most clubs here are large and have a significant number of senior citizens among their members. As a result, the flying fields are busy *all day,* every day. We retirees have the modeling time for which most of us have waited all our lives—and we're making the most of it!

Another migrant is Lt. Col. Richard Hughes of Lakeland. Dick started with a .049 Mini Mambo using a Min-X single-channel superhet. This was very successful and, as he says, it was "fun, fun, fun!" After trying the modern stuff, he now appreciates the relaxation he enjoyed with Live Wires, etc., and he says he'd "kill" (I hope we can't take him literally!) for a Mambo, a Smog Hog, or an L.W. Champ!

His current project is a scaled-down (.049 size) L.W. Yankee. This sounds ambitious, and I wonder why he didn't choose an L.W. Kitten or Jr. Champ, which were both original-design 1/2As.

His next project will be a scaled-down version of the '60s MAC 17 using R.E.M., which the AMA once called "Class 2." The plans show a rather sleek, trike-geared shoulder wing, and this should make Dick very happy!

NOT SO GOOD!

I was pleasantly surprised to hear from Jim Adams of Santa Ana, CA; he's the president of SAM, and his interest in R/C dates back to the '30s. Back in '39, the Good Bros. R/C stuff intrigued two high school students—Jim and his friend, Bill Langenbach. They decided to give it a try as a school project. They would build a biplane of their own (who said bipes were new?) and use the Good radio.

Apparently, the airplane wasn't a problem, but the intricate radio proved to be too much for them. The relay called for winding 5,000 turns of fine wire onto the coil form and, even

(Continued on page 60)

GOLDEN AGE OF R/C

(Continued from page 58)

The late, great, Jim Kirkland at a '60s Nats. (Looks as though Warren Hall is his caller.) Navy judges. Antenna "knob" shows radio was Orbit digital on 27mHz.

with the use of the school's lathe, this was a formidable task for two schoolboys. How would *you* like to try it? They weren't able to complete the project.

Jim's first success was with a Rudder Bug, which did, at least, fly! It used a Lorenz "two-tuber" and a Sigma relay (a popular combination at the time). Sigma was *the* relay in those days. He made many flights with only intermittent control (at best), and when he finally had full control firmly established, he crashed the Bug on the runway!

Jim says that in 1969, Dmeco donated a Live Wire Sonic Cruiser kit to one of the first SAM events at Taft. His buddy won it and still has it, but Jim is still trying his best to talk him out of it! If he can't, he still has an Over and Under kit on the shelf; he cut it out in the '60s so that he'd have it to fall back on.

In closing, Jim refers to *MAN's* 60th Anniversary issue and to the brief history of model aviation. We said the Jr. Birdman program collaborated with the AMA, and that would have been during the years '35 through '38, or so. Jim reminds us that the AMA wasn't formed until '39, so it must have been the NAA, whose activists did so much to make the AMA possible. *MAN* provided monthly space for the NAA news.

LITTLE BLACK BOX!

In my last column, I started discussing the origins of our modern radios. Remember, the digital principle opened the door to proportional systems, which paved the way for today's equipment. Recall that transmitter color was related to the brand: Bonner (white), Kraft (gold), PCS (brown) and Orbit (black)—the one that probably started it all.

Beginning in the reed era, R/Cers felt superior if they had an Orbit, and this led to Orbit systems being nicknamed "black boxes" worldwide. Dunham once said he was tempted to change the color because of the high temperatures frequently encountered on flying fields, but he didn't dare to, because modelers expected Orbit to have magic black boxes!

INTO ORBIT

While *all* manufacturers changed equipment styles almost yearly in those days, Orbit was one of the most progressive. Even when the company had an accepted, reliable system on the market, they dropped it quickly when they had something better to offer. This shows just how fast R/C was moving.

Reeds were in "full bloom" when Space Control showed that propo was the future. Very quickly, Orbit absorbed S.C., dropped reeds and was in the propo business! The Orbit analogs cured any shortcomings of the S.C. and showed that propo was for real, but, just as quickly, analog disappeared and Orbit had a digital.

I switched to Orbit analog late one season, spent the winter getting used to it, and, when I showed up at the next Nats, Orbit digitals were everywhere! Fortunately for me, those Orbit analogs were fine systems, and mine wasn't a handicap at that meet!

As with all Orbit systems, the company's first digital system was on the leading edge of technology. Orbit employed accomplished electronic engineers who were headed by Bob's brother, and he spent much time on developing new ideas before production began. This work paid off, demands were met, and reliability was improved.

Compared with analog, the digital system had a smaller, lighter receiver and Ni-Cd, but servos were larger and heavier. With these servos, Orbit acknowledged the technical superiority of linear servo output, offering single servos with both linear and rotary output capabilities.

With the new servos, the precise (but fragile) Micro-Mo motor with its self-contained gear train was gone—abandoned for a simpler, more robust Japanese motor. The reliable new motor was originally produced for movie cameras, and high-volume production made it comparatively inexpensive. The change in motors required the addition of a servo gear train, and this led to the style we still use.

The original Orbit digital system was very reliable and widely used. There was obviously room for improvement in its size and weight, however, and this came later, with improvements in electronic components.

As usual, Orbit moved on. As well as improving the radio, a major step forward was the production of new, miniature servos. At the time, they were the industry's smallest, and they're

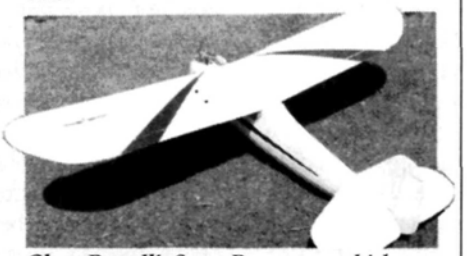
Glenn Powell's version of Bill Winter's R/C Sniffer widened the scope of free flight. Bill couldn't resist the design's attractive appearance. The R/C version was REM (rudder, elevator, motor) with .35 power, and its performance was pleasing.

SUPER SNIFFER MEETS THE COMPUTER RADIO!

CHECK OUT THESE photos! They were sent to me by Glenn Powell, who was originally from Cleveland, OH, but is now a fellow member of the Valkyries Club of Manatee County, FL. He's an avid OTer with interesting early stories. He says he started with a Madewell .49 C/L bipe and, while flying it with a U-Reely, he accidentally pushed the line's "let-out lever." The increase in line length allowed the bipe to make a sizeable dent in the local school's brick wall! Fortunately, his introduction to R/C was more successful.

Did you know there was a big Esquire? Glenn Powell's was .60-powered and like a sailplane. It would climb out of sight at idle and float like a sailplane. No hot rod, for sure!

Glenn learned with an L.W. Trainer and then with a Rebel. As was usual at that time, he used a K&B .09 and a Citizenship radio. Later on, he used a Veco White Cloud with a Fox .19 and Citizenship. He says he couldn't keep this one upwind (so necessary with rudder only), and he must have paid local farmers more than it was worth, at $5 a time, when they repeatedly found it miles away from its takeoff site. What memories!



Glenn Powell's Super Buccaneer, which was widely used in very early R/C. It was so docile that even pylon-racer types lined up for some relaxing stick time.

Glenn once enjoyed free-flying with the popular Sniffer (he lost more than one!). His current project neatly fills his needs for a slow flier, and gives him much enjoyment. It's Bill Winter's enlarged .35-powered R/C Sniffer. He also has a Brat .25-powered Golden Sniffer with spoilers, which were added to help him cope with a cramped landing area. The spoiler's nose-down tendency worried him until, with his computerized radio, he coupled in up-elevator. Now it settles in like an angel!

Glenn says he enjoys *MAN*, and he hopes *you'll* enjoy the pics of his OT models.

only slightly larger than our current miniservos. One of their outstanding exclusive features was a "caged" gear train. The gears were in a self-contained section of the servo, and this gave the gear shafts positive support while allowing the servo to be disassembled without disturbing the gears.

This system made Orbit an industry leader as far as basics are concerned.

There's more to the Orbit story, but I'm out of time for old time; I'll tell you more *next* time!

Keep in touch; this is *your* OT R/C place! ■

FIFTY YEARS AGO

WAR PLANES AND THE "AIRMOBILE" MAKE THE HEADLINES!

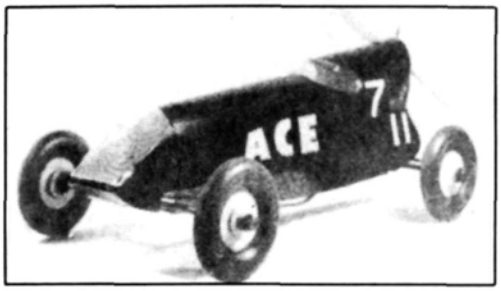
by KEN RUDDOCK

"THIS BIG, GAS-ENGINE power plane really flies—and you can win it!" exclaimed an ad in the March 1940 *MAN*. If you entered the Skyrider Pilots' Club Contest, you'd find out "what a thrill it is to start the motor of this powerful flying model and watch it go! A perfect takeoff, soaring climb and 10 minutes of dips, dives and zooming curves were made possible by 1/4 horsepower and a 4-foot wingspan."

While the Skyrider contest was the big news among advertisers in March 1940, the planes being used in the war in Europe continued to command the attention of *MAN* readers. On the cover, a Curtiss XP-42 pursuit plane was shown flying over the battlefields of Europe (an occurrence that never actually materialized). Robert McLarren, who provided plans for the plane, wrote, "With the Curtiss XP-42 pursuit plane comes the victory aviation has been patiently awaiting for 15 years: an air-cooled radial engine with less parasite drag than an equivalent, in-line, liquid-cooled type." The XP-42 was powered by a Pratt & Whitney Double Wasp engine.

In "Frontiers of Aviation," Robert Morrison profiled such airplanes as the Curtiss XSO3C-1 shipboard fighter, Britain's Boulton & Paul Defiant, the mammoth Russian six-engine bomber and the German-built Messerschmitt Me. 109, a single-seat pursuit plane. He also told his readers about the Sikorsky S-44, a large flying boat that was designed for transatlantic commercial flights.

Douglas Ingells told *MAN* readers that 10,000 planes were in service, while Robert McLarren offered a "News Flash" on the latest aircraft ordered by the U.S. Navy. Among those planes to go into active duty in 1940 were the Republic P-41A pursuit plane and the Consolidated XPBY-5A amphibian flying boat.



The Airmobile, nicknamed the "Ace," was featured in the March 1940 issue of MAN.

Lau Ka Yim, one of several modelers from around the world featured in "Air Ways," won first place in the Hong Kong Model Plane Contest.

The German-built Messerschmitt was one of the planes included in "Frontiers of Aviation," a regular MAN feature during the war years.

THE AIRMOBILE

Alan Orthof introduced *MAN* readers to the Airmobile, an easy-to-build racer that "will keep pace with anything on the model race track." He provided detailed plans, along with photographs of the completed car. Driven by an airscrew powered with a model gas motor, no complicated transmission was required. The car, with its aerodynamic shape and a rear propeller, could reach a speed of 60mph. The author said it could also be "tethered to run a large circle like a full-scale race car."

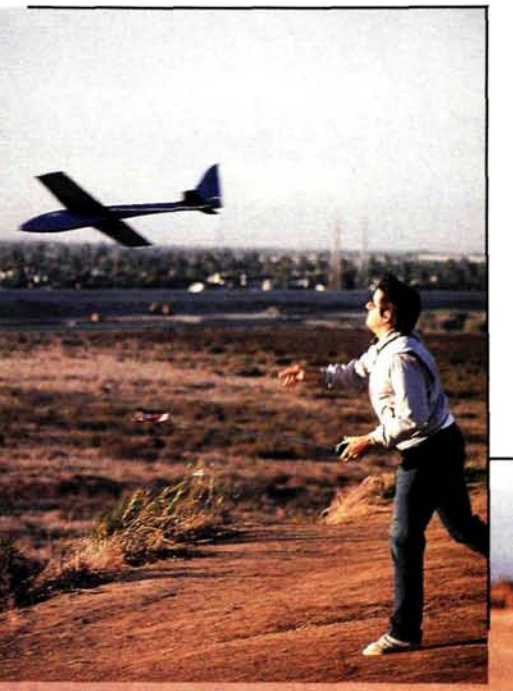
Although the Airmobile must have piqued readers' interest, other articles got back to what *MAN* was all about—airplanes. Editor Charles Hampton Grant continued his series on the "Fundamentals of Model Plane Design," while Leo Weiss began a series headlined "Designing Gas Models for Performance." The article was the "first in a series that provides you with simple and accurate methods of determining the performance characteristics of planes."

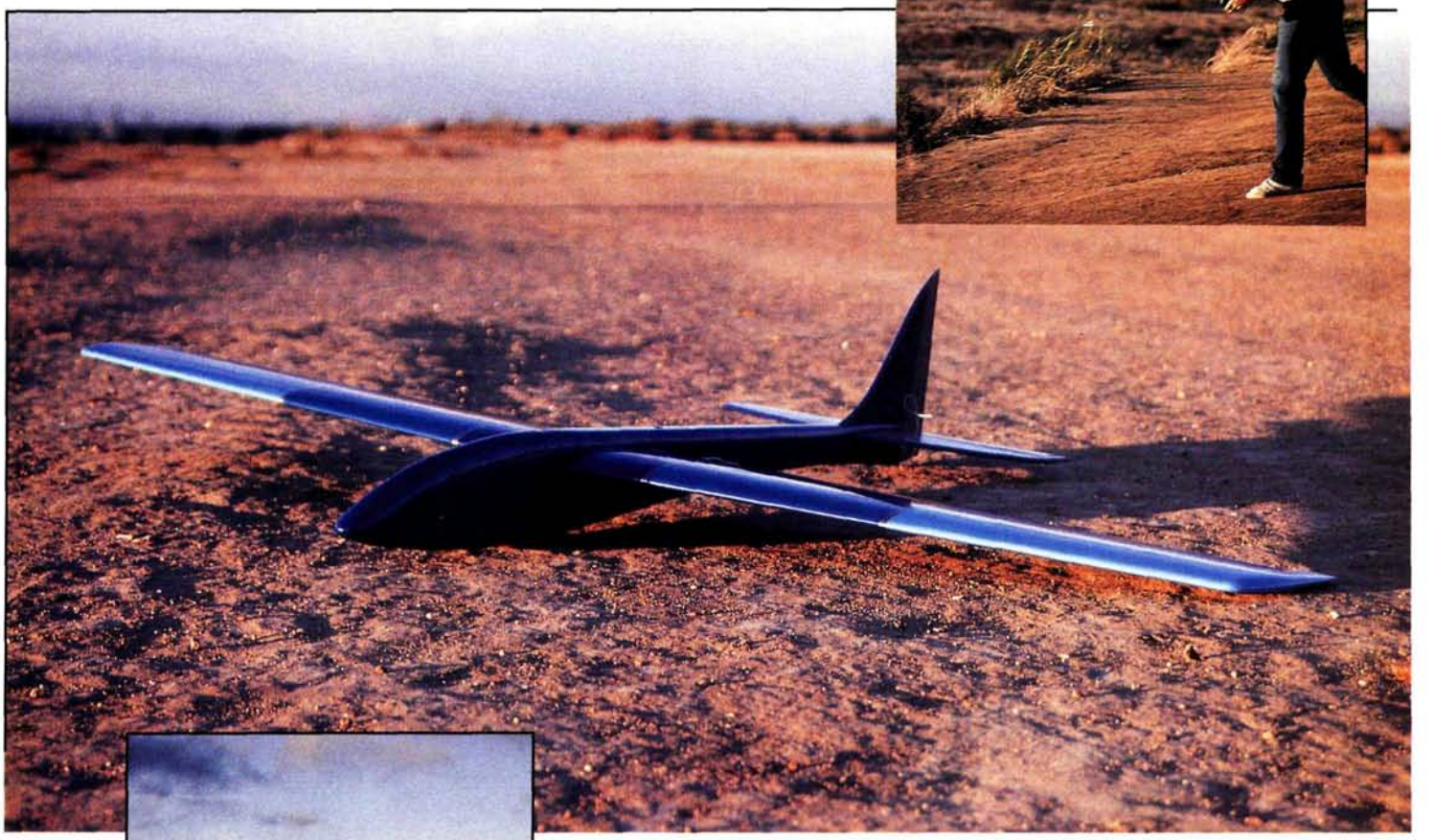
WORLDWIDE MODELING

Among those featured in "Gas Lines" were R. Davie with his Valkyrie which took second place at a meet in Sydney, Australia; thermal riders at Nutley, NJ; a Cape Town, South Africa, meet; and other modelers and clubs from around the world. "Air Ways" pictured more models and builders from all parts of the world. A complete report on modeling "south of the border" included a glimpse at what modeler Aldo Zeoli was doing in Argentina. ■

SAILPLANES INTERNATIONAL

SECRET WEAPON





PHOTOS BY DIETER LAMPRECHT

by DIETER LAMPRECHT

THE SAILPLANES International* Secret Weapon is a slope ship that's designed for aerobatics. Its styling resembles that of many European high-performance aerobatic ships. With its broad fuselage profile and fin, this kit model can make unusual slope maneuvers like point rolls and spins!

THE KIT: Like most kits with foam-core wings, the Secret Weapon comes in a large box. The contents are packaged well, with the pre-sheeted foam cores packed between cutting blanks, and the high-quality wood seems well-suited to its purpose. The wooden parts are all machine-cut and

(Continued on page 67)

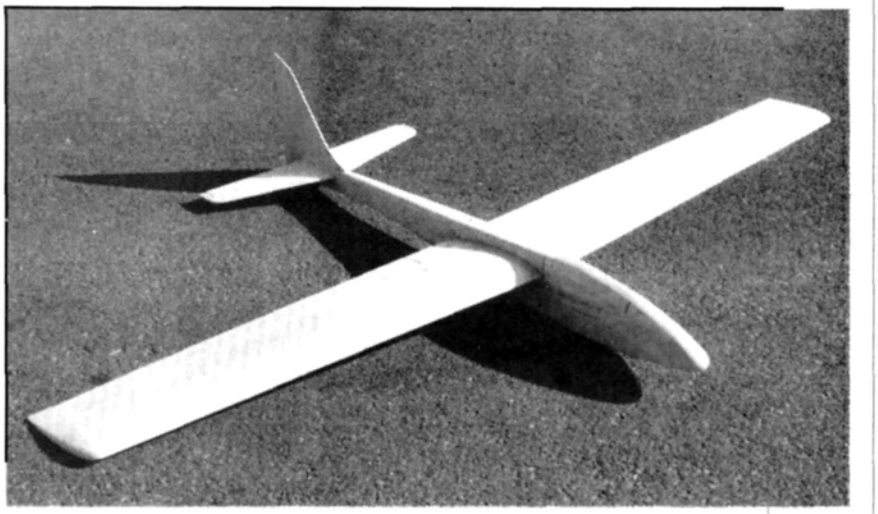
Broad performance envelope makes this sloper suitable for novices and advanced glider guiders

SECRET WEAPON

(Continued from page 65)

stamped with a part number, and they fit together well. The complete hardware package includes all the pushrods, control horns, clevises, strip hinges and fiberglass cloth you'll need to complete the model.

The rolled plan shows full-size cross sections of the airplane where construction details are required, including the front half of the fuselage, the tail and the wing-root trailing edge. The reduced-size drawing of the wing planform is well-marked and easy to understand, and the instruction booklet, although only six pages long, is thorough. The average modeler should have no problem following the step-by-step sequence.



No open structure here! Obechi-sheeted foam wings and a built-up balsa fuselage create a sleek, solid ship.

CONSTRUCTION: The Secret Weapon is constructed like most models that use foam-core wings and a built-up balsa fuselage. Therefore, I'll give a simple overview of the construction and comment on areas of interest or difficulty that I encountered.

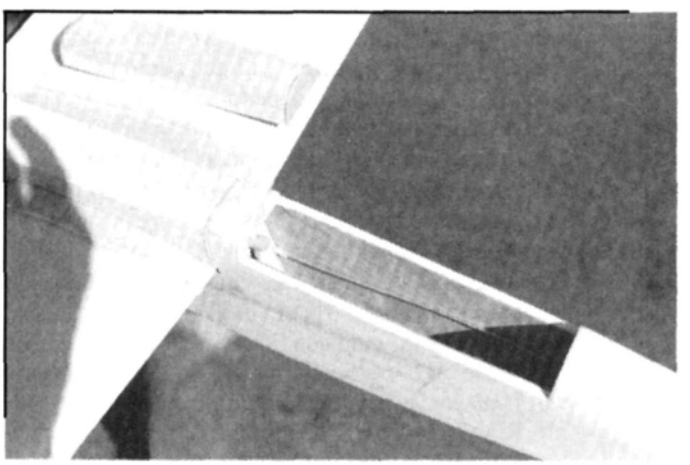
Building begins with the wing. The foam cores are already sheeted with obechi, so the first step is to glue the pre-shaped leading edge and aileron facings into place. Wood-to-foam joints should be done with epoxy. (I chose Devcon 5-Minute Epoxy.) Next, in preparation for joining the wings, the foam core at the root of each panel is grooved to accept the dowel. Clearing this area of foam prior to joining makes alignment and drilling of the hole much easier, as there's no hard epoxy joint to "excavate." The wing panels are then glued together.

When the center glue joint had cured, I attached the wing tips and fit the ailerons/trailing edge, which are spot-glued to the aileron facing with a few drops of Zap* CA. Then I sanded the entire wing to shape. (I reversed the sequence given in the instructions, which suggest that you attach and sand the ailerons and then glue on the tips and sand them to shape; just a personal preference.)

Carefully remove the ailerons and cut a small section off each root. These pieces are then grooved to house the torque rods. After checking the alignment of these assemblies, glue them to the wing and fiberglass the center section to strengthen the joint.

The fuselage requires a little more work than the wing does. Because of its length and height, three pieces make up each side, with the joints positioned under the canopy area where they can be strengthened with 1/32-inch plywood doublers. Before installing these doublers, make sure you have one positioned for the left side and one for the right. (How many times have you heard that?!) Because the Secret Weapon is a mid-wing-type aircraft, the wing fairing is built as part of the fuselage; this allows it to be sanded to shape with the fuselage for a cleaner fit.

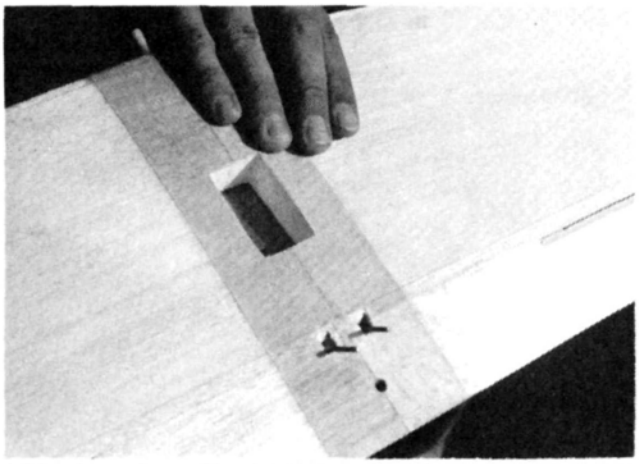
The instructions recommend that you place one servo in front of the no. 2 for-



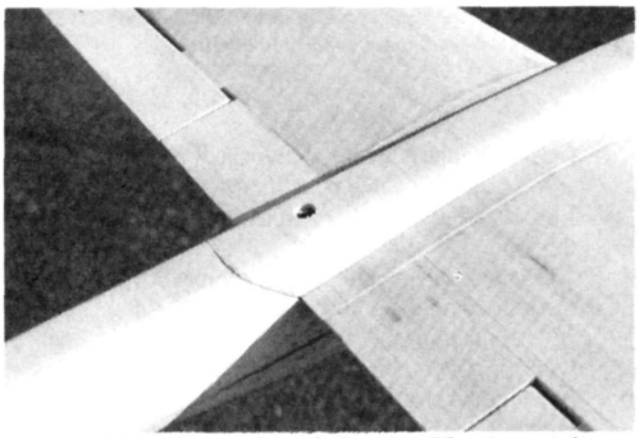
The open hatch shows 1/32-inch ply doublers in the nose where the fuselage sides are spliced. All hatches and fuselage openings are faced with 1/32-inch ply.

SPECIFICATIONS

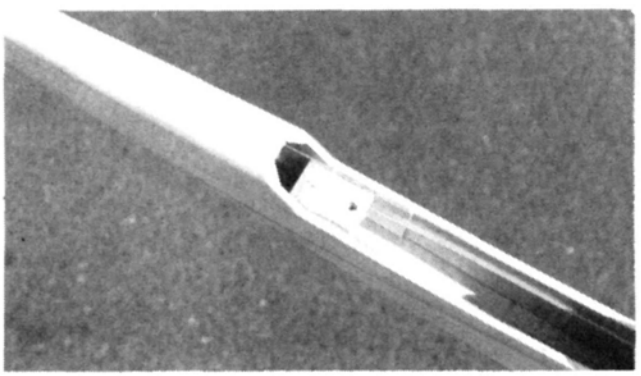
Type: *Sport aerobatic sloper*
Span: *61 inches*
Area: *490 square inches*
Weight: *44 ounces*
Length: *46 inches*
Wing Loading: *12.9 ounces/square foot*
No. of Channels Req'd: *2 to 3*
Sug. Retail: *$114.95*
Features: *Pre-sheeted foam-core wings; balsa fuselage; full hardware package; detailed plans; concise instruction booklet.*
Comments: *The Secret Weapon is easy to assemble and can serve as a slope trainer or an advanced aerobatics slope ship. For the price, you get a superb, sleek aircraft that's durable and smooth-flying.*



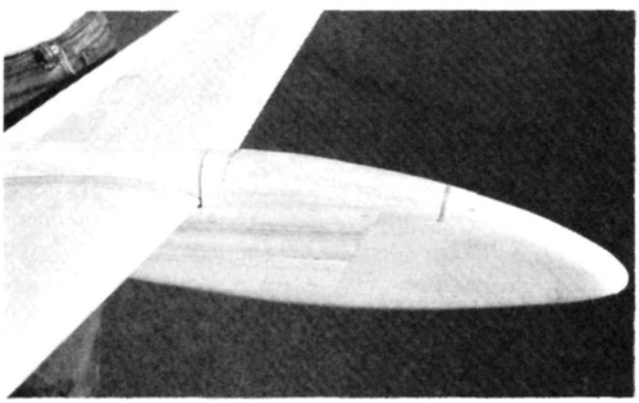
This wing center-section detail shows the aileron servo cutout and torque rods. Note the large (dark) area covered by the fiberglass cloth reinforcement.



The wing fairing fits snugly with the wing. Fiberglass reinforcement tape can be seen on both sides.



The wing-saddle area shows the narrowness and depth of the fuselage below the wing. A wing-mounting plate and tail-surface cable housings are visible.



A side shot of the forward fuselage shows the clean fit of the hatch and wing fairing. This is achieved by building the entire fuselage as one unit.

mer and the other behind it. I was using older, rather large radio gear, so I placed both servos in front. Install the plastic conduits for the control cables and then glue the formers into place. Make sure that the fuselage is square, and join the fuselage sides at the rear.

The top and bottom sheeting are attached next. The instructions say to run the 3/16-inch sheet lengthwise in one piece, wetting the bottom so it can follow the fuselage contour. I dislike this approach because the balsa is stiff lengthwise and only covers the triangle-stock longerons, not the actual fuselage sides. As a result, I cut the sheet and attached it cross-grain. This required a little more wood than was provided in the kit, but it saved me a few headaches! Finally, the three blocks that make up the hatch are glued into place, followed by the nose block, which consists of a plywood core and balsa sides.

I thought I'd have to hike to the bottom of the slope, but the Secret Weapon knows how to make the most of the available air and stayed airborne-even in the light lift.

Before sanding the fuselage to shape, mark the fin location on the top sheet and cut the slot lengthwise; don't remove the wood yet, though, as it will provide extra strength in the rear during sanding. Some sanding can be done to round the fuselage for a sleek look. I ended up sitting in a small mountain of balsa dust!

The tail surfaces are constructed last. Both the fin and stabilizer are made of several 1/4-inch sheet pieces that are glued together and sanded to shape. The instructions call for gluing the tail surfaces to the fuselage at this point, but I prefer to cover them first. After sanding the entire ship, the wing fairing and front hatch are cut free of the fuselage, and the wing is fitted.

I decided to try Hobby Lobby's new Oracover* for this model, which was easy to apply, especially on the fully sheeted surfaces. It was easy to iron, and it didn't bubble or lift up from the wood.

After gluing on the rudder and elevator and hinging all the moving surfaces, install the radio. I chose a Futaba* 7-channel FGK series, which allows me to make quick adjustments in the servo throws and electronically couple the rudder with the ailerons.

Although the fuselage is deep, it's only 1 1/4 inches wide, so radio installation must be an "in-line" arrangement. There was plenty of room, as I could install the rudder and elevator servos (Futaba S-28s) in front of the wing. I used another S-28 in the wing for the ailerons and a 1000mAh battery pack in the nose. The receiver was located under the wing to balance the airplane, so no lead was required. To ballast the Secret Weapon for high-wind conditions, I move the receiver to the nose and use the entire area under the wing for lead. I checked everything out and I was ready to fly!

PERFORMANCE: The initial test flights took place on a calm day at the local slope. I was amazed at how smoothly the aircraft handled! The controls were re-

sponsive, yet not overly sensitive; the tail moment is longer than that on most American slopers, making the plane less sensitive to pitch, and the large fuselage side and fin area make it track straight. I was also surprised at how little wind it took to launch the plane. I thought I'd have to hike to the bottom of the slope, but the Secret Weapon knows how to make the most of the available air and stayed airborne—even in the light lift.

The plane showed no tendency for adverse yaw, and it tracked accurately through turns. I became more daring and tried some simple aerobatics. Loops, rolls, stall turns—the Secret Weapon did it all! The roll rate was somewhat slow at the recommended aileron throws (3/8 inch each way), so I increased them 1/4 inch with a noticeable improvement.

The Secret Weapon has all-sheet tail surfaces. The bottom of the rudder is reinforced with spruce to prevent nicks and breaks on hard landings.

On the second day, the wind was very strong and gusty—the kind only the heaviest of slope ships challenge! I hadn't had time to make up any ballast for the fuselage, but I wanted to see how the plane would perform under these conditions. Although comparatively light, it managed to penetrate the wind with no difficulty. The gusts did bounce it around a bit, but that's nothing a pound of lead wouldn't cure.

This aircraft has a lot of potential for aerobatics because the fuselage side profile is wide enough to act as a lifting body. Some day, I'll be able to do point rolls and other difficult maneuvers, but for now I'm satisfied with just burning a few holes in the sky!

**Here are the addresses of the companies mentioned in this article:*
Sailplanes International; *distributed by Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728.*
Zap; *distributed by Frank Tiano Enterprises, 2460 SW 85th Terrace, Davie, FL 33324.*
Oracover; *distributed by HobbyLobby International, 5614 Franklin Pike Cr., P.O. Box 285, Brentwood, TN 37027.*
Futaba Corp., *4 Studebaker, Irvine, CA 92718.* ■

The Freedom 20.™ Proof positive

The Freedom 20's instruction booklet makes building easy—even if you've never built a model before.

Clear illustrations guide you through every step of construction and equipment installation. Covering materials and techniques are described, plus there's a section on adjusting and flying your plane.

AIRWAVES

(Continued from page 12)

should be something with a slightly higher wing loading—perhaps a semi-symmetrical airfoil and probably ailerons. While the Sig Citabria has all of these and is a great model, it's scale and will require a lot of building—some of which is tedious. Until your flying skills have reached the point where you feel comfortable flying a plane in which you've invested so much time, stick with planes that are easier to build and repair. Good luck!

RAU

CHIPS

(Continued from page 24)

and install it as shown.

Install the servos and receiver, and balance the airplane by moving the battery pack fore and aft. Standard hardware is used between the servo and the aileron horns, and an inner Nyrod with clevises for the rudder and elevator. The throttle line is made of soft music wire or cable.

Set the aileron throw for about 3/8 inch up and down, measured at the root. Elevator and rudder throws are about 3/8 inch from neutral in both directions. When everything has been mounted and is working properly, range-check your equipment and fly!

PERFORMANCE: Taxi around for a while before attempting to take off. The airplane tends to stay straight on the take-off run, and just a little rudder will bring it back into line if it begins to wander.

With the gear arrangement shown, Chips will fly when the tail comes up. At a safe altitude, trim the airplane; then try a few stalls, both with and without power. A couple of loops (inside and out) will show the plane's lateral balance and, if necessary, you can add weight to the lighter wing.

Slow flight (with about a quarter throttle) is smooth, so set up the landing approach by gradually reducing throttle and slowing down. The airplane is relatively clean and will maintain its speed, so hold it off until it settles in. Good landings are easy; great ones come along quite often; and they're all fun!

**Here's the address of the company mentioned in this article:*
MonoKote; *distributed by Top Flite Models, 2635 Wabash Ave., Chicago, IL 60616.* ■

SCALE MASTERS

(Continued from page 36)

which was complete with flaps and slats and done in Blue Angels' colors.

Poor Dennis Crooks lost his competition F-14 Tomcat during a practice session on Thursday, but with his no. 2 demo model, he put on some great demo flights during the lunch breaks on Saturday and Sunday. He showed how a Tomcat is *supposed* to fly and displayed the in-flight sweeping-wing function many times! One of Yellow's kits did make it into the top 20, but it wasn't a jet. Nope; it was Jack Buckley's exquisitely detailed CAP 10 that did better than all the jets!

This year's event was a success, but I think that 18 qualifiers are too many, that stricter methods of qualifying should be employed and that the rules should be tightened a little. The Masters for our sport should carry the same connotation as it does in other sports, e.g., tennis and golf. A Masters competitor should be a Masters competitor, not someone who qualified simply because nobody else showed up for the regional.

With this in mind, I offer you the following thoughts: one (possibly two) contestants did *not* qualify for the event

through the regional qualifier process like everyone else did. What would have happened if this person, whom we all like and respect, had *won* the Masters? What would the pilots who finished in 2nd or 3rd place have done when it dawned on them that the Masters Committee had allowed such a thing to happen?

If this *had* happened, or if it's possible that it could happen again, I think you might agree that there would be no better time to *check your six!* ■

QUIET FLIGHT

(Continued from page 38)

been available for many years; one of the earliest units was from Pilot, and it came with its E-Fly model. It wasn't successful—not because it didn't work, but because no one trusted it!

Other units have come and gone. Some worked well, and some motors suffered from RF noise, which they transmitted to the receiver, or they didn't always shut off before the battery voltage dropped below the point where the receiver could still operate.

Like everything electronic in the hobby field, however, they've been improved over the years. There are now several units available from such manufacturers as Futaba*, JR*, KO Propo*, Kyosho* and Airtronics. They're available as power switches or as fully proportional throttles, and they all seem to work quite well.

Why should you use one?—because weight is the number-one problem in nearly all electrics, especially in 7-cell, or smaller, flight systems. Most BEC units are designed to work with these flight systems, and they can save valuable ounces by eliminating the airborne battery. Depending on the battery you'd otherwise use, you can save 2 to 4 ounces, and maybe even another ounce or so over a servo and microswitch. This can sometimes make the difference between a so-so model and a good performer.

How well do they work? I've used the Graupner JR power switch, the KO Propo power switch and speed control, and the Futaba speed-control/receiver combination. All three units worked well, and all the aircraft in which they've been mounted have survived. Most are designed to work with moderate amperage draw, as is found in a ferrite motor system. I know modelers who have used them successfully with cobalts, although the manufacturers don't recommend this. They're primarily designed for sport flying.

These units cut off power to the motor by sensing the voltage drop just before the batteries discharge; this leaves ample power for several minutes of flying time. The time varies from one unit to the next, but the units I've used left me with plenty of time for fairly long, extended, thermal flying. As far as I can tell, they don't shorten the motor run significantly. They *do* reduce your model's overall weight and improve its performance, and because there's less equipment in the fuselage, radio installation is easier. They aren't that expensive, so give one a try; I'm sure you'll like the results!

NEWSLETTERS

If your soaring or electric club puts out a newsletter, please put "Quiet Flight" on your mailing list. I'd like to be able to report on all new products, hints, aerodynamics findings and contests, but I can only do so much! Many of the newsletters I receive address these topics, and they're a great source of information that I'd like to pass on. I can't promise that I'll use everything that comes in, but when I do, I'll give the contributing club and

(Continued on page 74)

QUIET FLIGHT

(Continued from page 73)

author credit.

If you send in a newsletter and there's something that you would *not* like put into print, please include a note to that effect. Last year, I ran a piece from a great newsletter that the author planned to present to another magazine for publication. The newsletter editor stated (in print) that all information was available for reprint, as long as the club and author were given credit. My use of this material prevented the author from submitting his work for publication as he had planned. If I had known this, I wouldn't have reproduced the article, so *please* keep me informed, and keep those newsletters coming in.

Till next time...good thermals and a full charge!

**Here are the addresses of the companies mentioned in this article:*

Carl Goldberg Models, *4734 West Chicago Ave., Chicago, IL 60651.*

Zap; *distributed by Frank Tiano Enterprises, 2460 SW 85th Ter., Davie, FL 33324.*

Airtronics, Inc., *11 Autry, Irvine, CA 92718.*

Taylor-Craft Ltd., *216 Willow Ave., Roseville, CA 95678.*

(Continued on page 76)

QUIET FLIGHT

(Continued from page 74)

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*
JR/Hobby Dynamics, *4105 Fieldstone, Champaign, IL 61821.*
KO Propo/Global Hobbies, *10725 Ellis Ave., Fountain Valley, CA 92728.*
Kyosho/Great Planes Model Distributors, *P.O. Box 4021, Champaign, IL 61820.* ■

SCHNEIDER CUP

(Continued from page 48)

Frank Schoening's Sopwith Tabloid and Ken Merril's Curtiss R3C-2 hit 47.45 and 48 respectively, but a pattern was beginning to emerge for Robert Heitkamp and his Supermarine S.5. Heitkamp scored very high in static, and it looked as if he could keep an edge if he stayed in the mid-40s for the last heat. Seven pilots were still right behind him and climbing, and they were just waiting for a mistake.

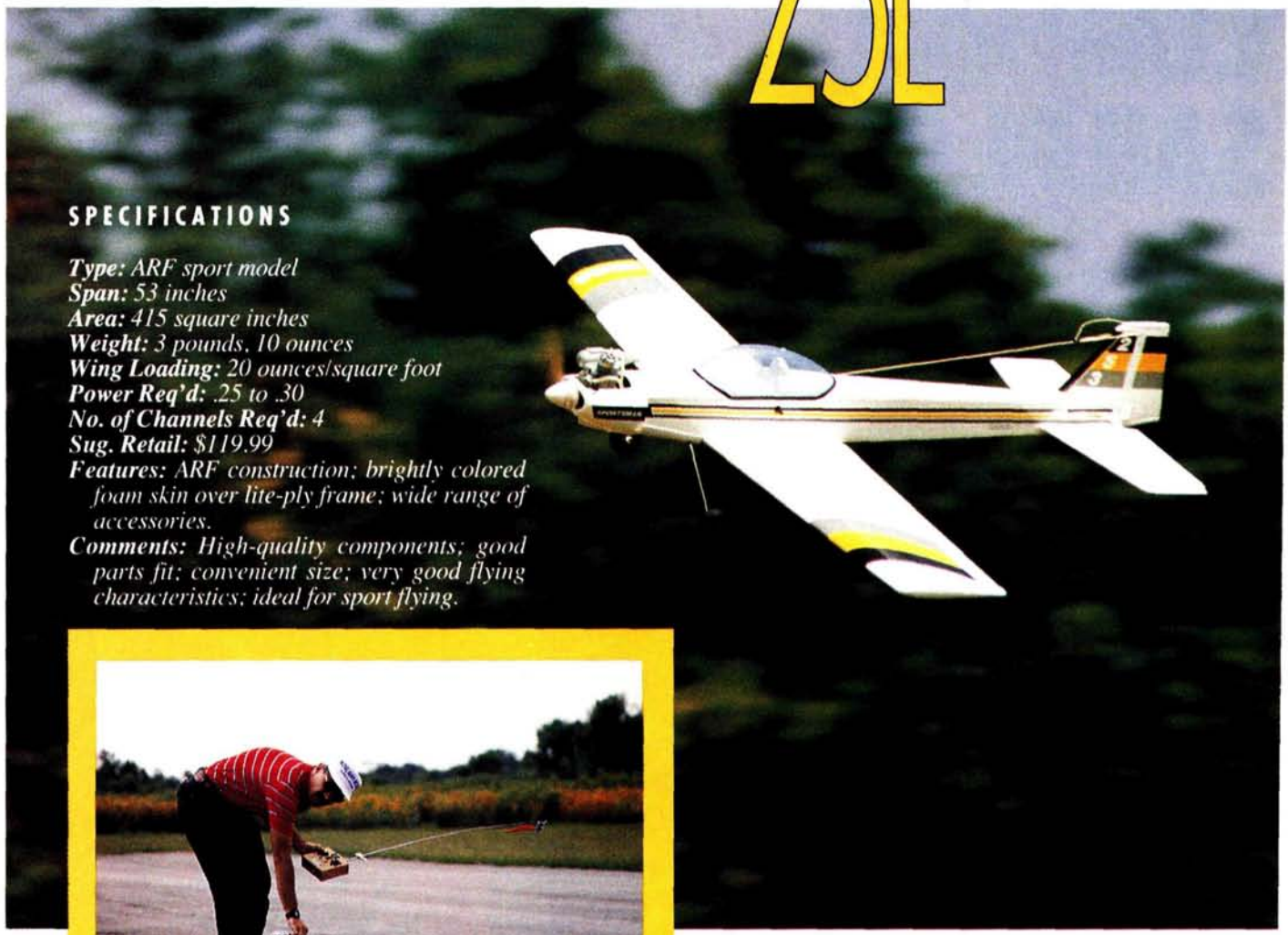
Midday on Saturday, the Schneiders went back to the pits, and the fun fliers took over again to churn the waves. There was an R/C air show demonstration (complete with red, white and blue

(Continued on page 82)

GLOBAL HOBBIES

EZ SPORTSMAN 25L

by RON FARKAS



SPECIFICATIONS

Type: *ARF sport model*
Span: *53 inches*
Area: *415 square inches*
Weight: *3 pounds, 10 ounces*
Wing Loading: *20 ounces/square foot*
Power Req'd: *.25 to .30*
No. of Channels Req'd: *4*
Sug. Retail: *$119.99*
Features: *ARF construction; brightly colored foam skin over lite-ply frame; wide range of accessories.*
Comments: *High-quality components; good parts fit; convenient size; very good flying characteristics; ideal for sport flying.*

Compact and quickly assembled, this ARF is perfect for sport-flying "small steppers!"

FOR SEVERAL YEARS, the popularity of almost-ready-to-fly models has been growing. ARFs have come of age in terms of engineering, materials, quality, variety and performance.

Manufactured in Japan by Sports Aviation* and marketed in the USA by Global Hobbies, the EZ Sportsman 25L should appeal to sport fliers. The whole EZ series is factory-built using an internal, plywood framework. The surface is a laminate of thin, but relatively dense, foam with a bonded color layer protected by a clear film. The brilliant and permanent colors, trim and markings are completed at the factory, and only final assembly and equipment installation are required. Sports Aviation, a leader in product development and quality, introduced this manufacturing process. It has the largest selection of ARF models, and it seems to introduce something new every few months.

The size and configuration of the Sportsman 25L make it a good choice for weekend sport flying and mild aerobatics. It isn't as glamorous as a warbird or an aerobatic pattern airplane, but it suits the needs of the average modeler. The .25 to .28 engines are economical to buy and run, and this size model fits easily into a compact car for a trip to the field. Although ARF models usually have a higher initial cost, the Sportsman's is lower because of its smaller size. (A .45-size version is available in the same configuration, and both sizes also come in high-wing cabin styles.)

THE KIT: Like most ARFs of this type, this kit is complete. Major assemblies (e.g., wing halves, fuselage, control surfaces and horizontal and vertical stabilizers) are already built and covered. The engine mount, fuel tank, wheels, plastic-tube pushrods, canopy, cowl and assorted metric hardware are included. Nylon control horns, clevises, etc., are on a molded parts tree, and there are plenty of extras. The kit's tiny tubes of quick-set epoxy weren't nearly enough, so I used Hobbypoxy* Formula IV instead, and put the tubes in my flight box for field repairs.

CONSTRUCTION: I made notes on the instructions whenever I encountered a problem or didn't care for the techniques shown, but, for the most part, the model went together as intended. The molded-plastic and pre-cut, lite-ply parts were shaped properly and fit well.

First, each wing root must be faced with a lite-ply false rib. This provides a vertical tongue that keys the wing to the fuselage former at the front of the wing saddle, and it's a novel substitute for the usual leading-edge dowel. The dihedral brace is made from one piece of balsa and one piece of lite-ply. Before laminating them together, trial-fit each in the wing halves and sand to eliminate binding and interference.

After joining the wings with epoxy, attach the top and bottom molded-plastic, center-section covers with thin CA. A little goes a long way, and too much causes runs; just press the cover evenly onto the wing and let capillary action draw the CA underneath. The final step of wing construction is the aileron-servo mount. Since the radio compartment is shallow, I trimmed the die-cut parts to bury the servo as deep in the wing as possible.

The completed wing didn't mate to the fuselage because the root chord was about 1/16 inch longer than the wing saddle. I shaved the plastic and the wood at the wing's trailing edge, and then I smeared on some CA to seal the exposed balsa.

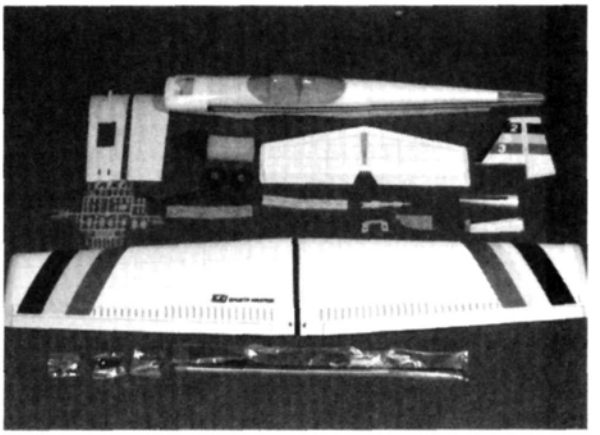
The first part of fuselage assembly is the installation of the wing hold-down bolt plate. I left this for last, though, because it obscures the back of the servo-mounting tray, and I moved on to step four: enclosing the top and bottom of the tail with plywood platforms. Hold on; did I miss the part about installing the plastic pushrod sleeves? No; the pushrods aren't even mentioned until radio installation in step eight! I can't imagine installing them without being able to see inside to apply glue where they exit the fuselage! This is a common problem with ARF instructions that experienced modelers take in stride. The instructions, however, should direct the builder to install the pushrod sleeves before closing off access to the tail section.

The horizontal stabilizer is screwed and glued into place next, followed by a molded-plastic bottom cover. Planning ahead, the builder can pre-cut a slot for the tail-wheel bearing and fill the void at the tail post with some scrap balsa so the tab has something to grab.

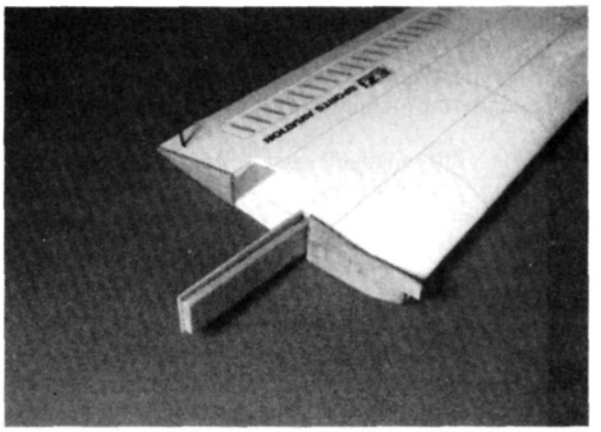
The vertical fin and its plastic cover are next. Balsa strip stock reinforces the joint where the fin meets the fuselage top plate. Except for the rudder, which must be slipped over the tail-wheel wire, all the control surfaces are pre-hinged. Although it isn't mentioned in the instructions, the rudder's leading edge should be trimmed so it can clear the bearing.

Engine and fuel-tank mounting are next. I chose a Magnum Pro .28 (from Global Hobbies), which is a Schnuerle-ported, ball-bearing engine at the top of the recommended displacement range. A plastic engine mount and aluminum reinforcements come with the kit. The soft plastic makes reinforcements necessary, but the mounting system is nice. The plan shows the mount held to the fire wall from behind with machine screws. Since I used blind nuts in my model, I put the screws in from the front.

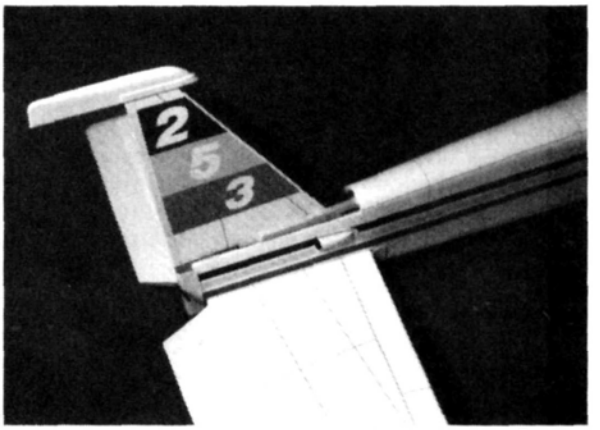
The molded tank fit perfectly through the fuselage former and up against a mating hole in the fire wall. The cowl is white, blow-molded plastic and mates well to the fire wall, but a lot of material must be removed for engine clearance. This is a trial-and-error process, and you'll have to shave the opening very



The kit includes pre-built, major airframe assemblies and many accessories.



The center section features lite-ply ribs with a leading-edge locating key. The robust dihedral brace is made of balsa and lite-ply.



Before the plastic cover is installed, the fin is attached to a lite-ply platform and reinforced with balsa fillets.

EZ SPORTSMAN 25L

carefully with a modeling knife. The thickness of the cowl wall varies, so the blade may slip right through a thin spot.

The radio installation is the final task. A plywood servo tray is provided, and it keys into the fuselage formers. This feature and the limited space in the radio compartment leave very little latitude for component placement. I anticipated that my older Kraft KPS-14 servos would be a tight squeeze, so I re-slotted one of the formers to allow the servo tray to be positioned higher up and to keep the aileron pushrods clear of the servos. (Actually, these servos aren't very big, but they rise above the mounting lugs more than some newer styles.)

Two, separate, full-length elevator pushrods are joined by a plastic crosspiece near the servo. Except for the problem of installing the sleeves, this setup is much easier than the old-fashioned, "Y"-shaped wire pushrod ends. My only other modification was to substitute braided cable for the music-wire throttle pushrod.

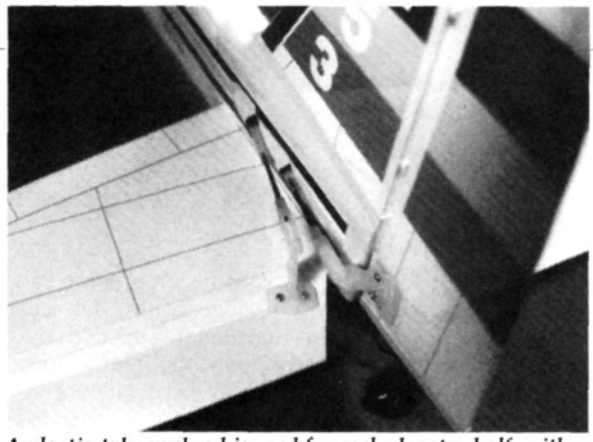
The completed model weighed 3 pounds, 10 ounces for a wing loading of 20 ounces per square foot, and this is in line with typical sport-plane specifications. The Sportsman 25L balanced at the recommended location without ballast weight.

The project took almost nine hours. I could easily shave off a few hours on the next one, and maybe more on a larger model that has more room for the radio. The convenience of an ARF model justifies its additional cost, and the finished product looks great.

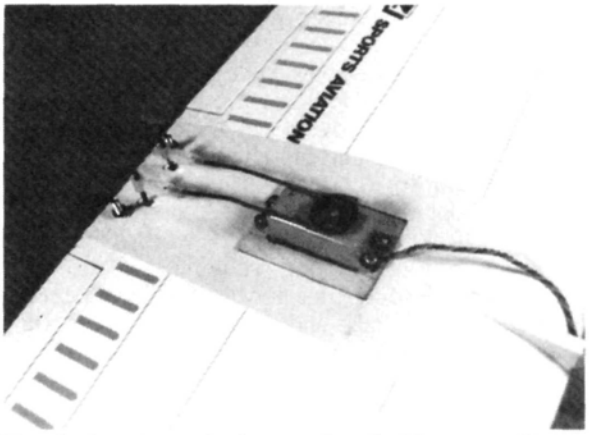
PERFORMANCE: I didn't expect any surprises from such a well-proportioned model, and the initial flights proved how well the Sportsman handles. Test flights were done from a paved runway, which minimized the takeoff roll but required gradual application of throttle and gentle rudder correction to maintain a straight ground run. The model also did very well, if not better, when it took off from a field. The landing gear is springy, though, so it bounced a bit on landings.

Since performance is very peppy, a smaller engine would have been adequate, but a hotter engine does increase the aerobatic capabilities of the plane. In fact, loops, rolls, snaps, spins and inverted flight are all on par with those of a larger airplane. The Sportsman has neutral stability characteristics, i.e., it goes where you point it, and doesn't self-correct for pilot mistakes as a high-wing trainer might. It's docile enough, however, to be a first low-wing model for pilots with some aileron flight experience. The model can be flown slowly without much risk of a stall, and when one does occur, it's gentle. The Sportsman 25L has a broad performance range, and it's a pleasure to fly.

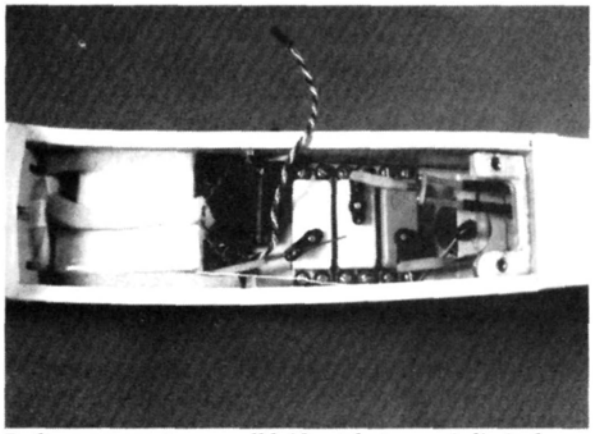
**Here are the addresses of the companies mentioned in this article:*
Sports Aviation; *distributed by Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728.*
Hobbypoxy Division, *Pettit Paint Co., Inc., 36 Pine St., Rockaway, NJ 07866.* ■



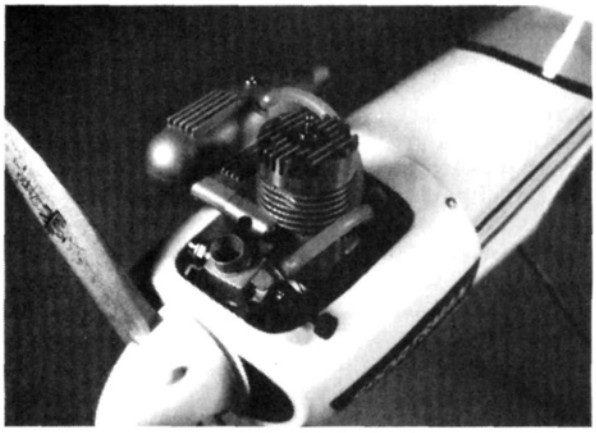
A plastic-tube pushrod is used for each elevator half, with a third for rudder. Exit fairings are molded plastic.



The wing's center section is strengthened with upper and lower plastic covers.



Radio components are well laid out, but space is limited.



The Magnum Pro .28 is an excellent choice for this model. The molded cowl requires trimming for engine clearance.

SCHNEIDER CUP

(Continued from page 76)

smoke), and the singing of the National anthem and a balloon release had everyone choked up and happy to be there.

Then it was time for the fourth heat, and this would close the book on the first Schneider re-creation. Ken Merril and Larry Botsford put in great flights with 47 points each, and Frank Schoening and Dick Skogland were right behind with 46 points. Bob Heitkamp pulled a 45 out of the hat and stayed on top. Of the 21 planes entered, 18 showed up on the final tally. Team Macchi took 5th place with a 1931 Macchi MC72.

The Macchi crashed at the end of the third heat, but it still had enough points to edge out Frank Schoening (153.8 to 153.6). It was very close. Bill Curry took 4th place with his wrecked Macchi M.33 on 168.9 points. Ken Merril, a Byron Show Team pilot, took 3rd place with 175.7 points. He was flying the 1925 Curtiss R3C-2 that had been purchased by the PIC Adhesives Company from the Bob Martin group before the race.

Second place went to Kenneth Bunt's 1931 Supermarine S.6B with 177.2 points. (Ken is chief designer for Byron

(Continued on page 84)

SCHNEIDER CUP

(Continued from page 82)

Originals.) The big one—1st place in the first-ever giant-scale Schneider re-creation—went to three people who drove all the way from *Juneau, Alaska!* Flying a .295-scale 1927 Supermarine S.5 with a Kiortz 3.7 powerplant and Airtronics Spectrum 7 radio, pilot Bob Heitkamp and builders Jim Wilder and Lou Bonnett (of the Gastineau Aeromodelers Society) took the gold with 178 out of a possible 200 points.

The Saturday night awards presentation was a stirring event. There were lumps in many throats, and a very warm, congratulatory feeling prevailed. Bob Martin thanked the Desert Hawks Club for their incredibly good job, and he presented an event poster signed by Jimmy Doolittle to 17-year-old Derrick Walkington, who had come within hours of finishing his 1913 Moraine Saulnier entry.

(Continued on page 87)

SCHNEIDER CUP

(Continued from page 84)

Mr. Doolittle had heard of Derrick's heartbreaker and asked that the poster be given to him. Norm Goyer gave a moving talk on the importance of teaching aviation history through scale-model aircraft. He stressed that only through this activity will people remember how these great birds looked, sounded and flew.

Then it was all over, except for the trip home. I can't think of an adequate way to thank the Desert Hawks Club for their supreme effort. The impact of the thousands of hours they spent on staging this event will travel like a shock wave through the entire modeling community. Just one example: Forbes Magazine covered the race for its December '89 issue, so news of our hobby will be on the desk of the chairman of every major corporation in the United States! Model aviation will never be the same!

Next year's race is tentatively scheduled for November 8 to 11. *Model Airplane News* will cover the preparations in a new feature called "The Schneider Corner," which will be part of the "Floating Around" column. Whether you have to fly, drive, walk or crawl, plan to be there. You won't be disappointed! ■

PROCTOR JENNY

(Continued from page 56)

At this point, I contacted the people at Proctor for their advice about engine and radio installation, since the information supplied on this was vague. They referred me to their expert builder and flier, Dick Hansen, who has been campaigning his Jenny for three years and doing very well. (His most recent achievement was sixth place at the Top Gun competition.)

Dick told me he uses an Enya* .80 4-stroke (the one I intended to use), which requires approximately 4 degrees of downthrust and 1 degree of right thrust. He also mounts his radio as far forward as possible, so I mounted my elevator and rudder servos, inverted, directly behind the fire wall. I ran my pushrods (supported in two places by plastic sleeves glued to cross-members in the lower fuselage) to the elevator and rudder control horns behind the rear cockpit seat. I mounted the receiver in foam and used a rubber band to secure them to the fuselage floor where the landing-gear mounting blocks are located.

My 900mAh SR* battery pack is mounted above the two front servos. Above this, there's a removable platform that supports the 8-ounce fuel tank. By mounting the equipment this far forward, I eliminated the need for nose-weight balancing.

The aileron servo is mounted directly under the front seat, whereas the aileron cables enter the fuselage and are attached to the servo control arm with a Du-Bro* EZ connector (the type that screws in from the top and provides pivoting in the servo arm). This "closed-loop" system eliminates any aileron slop and provides positive control.

PERFORMANCE: After many delays caused by poor weather, a suitable day for a test flight eventually arrived. I had arranged to use one of the best possible flying sites—a beautiful, *large,* sod farm. My friend Robin Lehman invited me to test-fly the Jenny at his club's private flying field, which is used exclusively for 1/4-scale models.

After driving the 50 miles to the field, I found the wind conditions less than ideal for a first flight. I also found—to my delight—a magnificent array of all types of 1/4-scale and 1/5-scale models. The wind was too much—even for the larger models—and as the day progressed, I decided to assemble my Jenny *just for photographing.*

When it was completely assembled, it soon became a focal point among these talented model builders, and this put me in high spirits and made me even more eager for a test flight—if only the wind would subside!

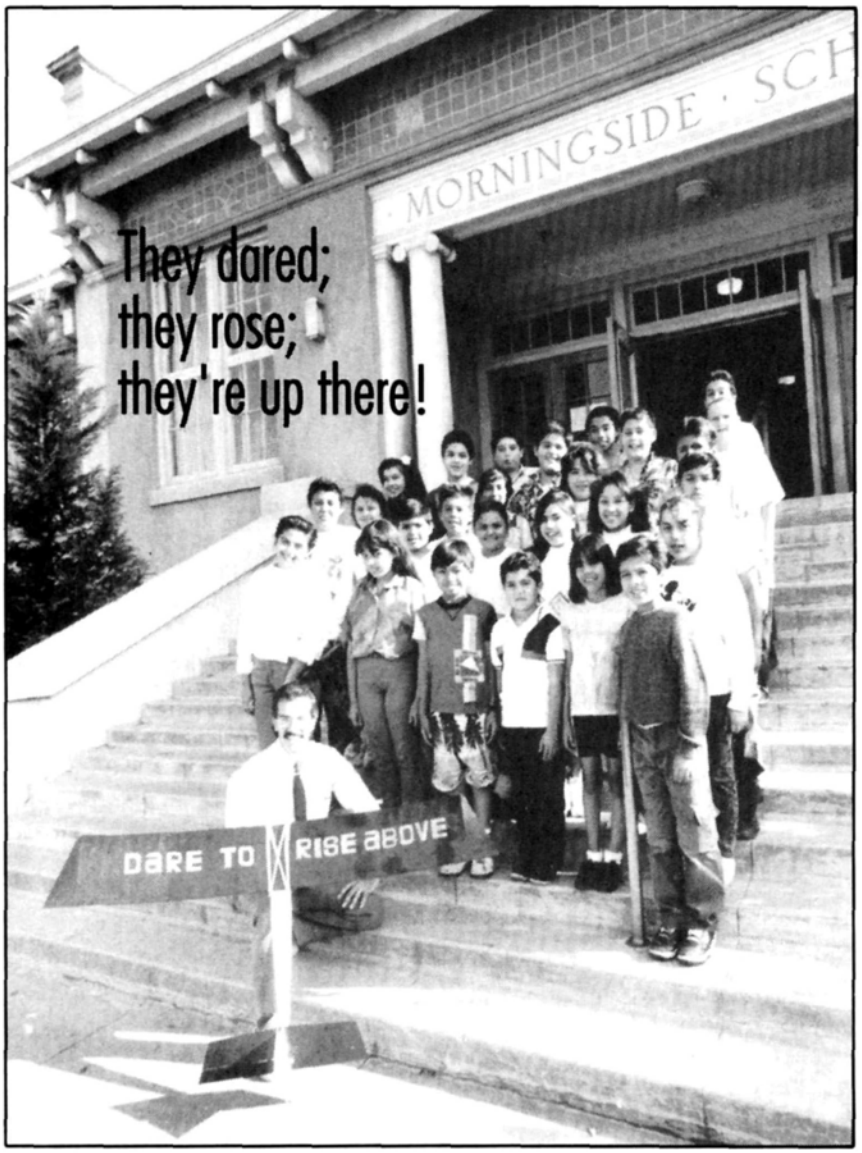
By late afternoon, I decided to taxi the Jenny to see how it would handle the wind while still on the ground. Though the tail skid moves freely and isn't coupled with the rudder, to everyone's amazement, despite the wind, the Jenny's generously sized rudder enabled it to make precise 180-degree turns.

It was five o'clock, and many modelers were packing up to leave. I eyed the windsock and kept thinking about a recent video I had seen. It showed Dick Hansen expertly flying his Jenny in *very* strong winds at the recent Top Gun Invitational. To the surprise of the contest judges, he also *landed* it in a direct crosswind.

It was 5:15. Could it really be true that the windsock wasn't flapping as wildly? Others confirmed my suspicions. I don't know what got into me, but I went quietly to the Jenny, filled the tank, took my transmitter from the impound area and started the engine.

Everyone assumed I was going to give it another taxi run. I almost thought that,

(Continued on page 116)



An Unusual First for R/C

We don't usually list names like this, but we don't usually show a crowd in which everyone's a winner! From left to right—Back row: Pedro Infante, Salomon Basaldua, Danny Frias, Saul Recendiz, Daniel Arvizu, Tony Gonzalez, Marshall Rouse, Victor Tovar. Next row: Linda Garcia, Israel Garcia, Lupe Venegas, Jaime Infante. First row from front: Juan Herrera, Andrea Esse, Tony Chavez, Jose Estrada, Lydia Cabral, Libertad Ayala, Michelle Rodriguez, Christina Quintero. Front row: Miriam Cuevas, Maribel Rios, Gary Allejandro, Rene Llamas, Monica Trujillo, Fabian Contreras. A justifiably proud teacher—Joseph Reed—holds the group's first plane.

by LYNNE SEWELL

DARE to RISE

IF YOU KNEW that the gift you'd bought a loved one would ultimately affect the lives of countless families, involve the Chief of Police in one of our major cities and get your name in a major magazine, wouldn't you decide to exchange it for a pair of slippers?

"We get to do science experiments, and other kids have to read out of books and learn the hard and boring way."—Michelle Rodriguez

It all started quite simply when Tish Reed bought her husband, Joseph, an R/C plane for Christmas. He had enjoyed building Estes rockets, but bemoaned the lack of control, so Tish naturally thought he might like to try a plane. He did!—but it didn't end there...

Joseph Reed and Michelle Rodriguez give us a close look at the group's Leisure Amptique. The artwork on the wing is by students at Mission College, and "Dare to Rise Above" is the message of the DARE (Drug Abuse Resistance) Program.

Don't even <u>think</u> that building airplanes isn't for girls! Here, Linda Garcia, Andrea Esse and Michelle Rodriguez discuss some of the finer points with Joseph Reed.

A fifth/sixth-grade teacher at Morningside Elementary School in San Fernando, CA, like all good teachers, Joseph Reed looks at most things with a view to how they can be used in the classroom. Now, five years after that crucial Christmas, R/C-related activities permeate his day, and Tish wonders if the gift was really such a good idea!

"We are the first elementary school students in the country to build radio-control airplanes." —*Salomon Basaldua*

The benefits of using R/C vehicles to motivate his students soon became apparent, but he decided to start with R/C cars, which would provide a challenge, but not an insurmountable one. For this he needed the support of his school's principal and money to spend. Neither was a problem. "What a fabulous support Mr. Dorough, my principal, is!" writes Joseph Reed, and the feelings are obviously reciprocated: "Joe Reed takes the time beyond what's required to do some extra-special things," said Mr. Dorough to the members of the local school board when he attended the meeting at which the children presented their R/C project.

What about financial support? Again, there are others who recognize a good idea when they hear it, and, with $1,000 from Congressman Berman's office and Pacific Telesis, the R/C program was running (literally!).

By March '89, the students had completed a fleet of cars, and the project culminated with a race in the school yard. "Every child in the class was interested, improved their academic skills and had fun, too," writes this high-energy educator. "The beautiful part of the R/C car program is that the cars will be dismantled and rebuilt year after year, so the program will continue."

PHOTOS BY TIM CARRUTH (Los Angeles)

Hard at work on an Electra! On the left, Monica Trujillo and Rene Lamas study the instructions together, while Lupe Venegas concentrates on her copy. Facing away, Saul Recendiz works on the wing.

"I have learned a lot through the airplane program, like reading, math and many other skills." —*Diana Gomez*

Right from the beginning of the program, Joseph Reed was impressed by the tremendous support given by local individuals; Dale Garner of Smith Brothers Hobby facilitated the purchase of equipment—even offering to *donate* it!—and Mr. Reed's teaching associates and his students' families were behind him all the way.

EYES ON THE SKIES!

Like a rolling snowball at Aspen, the idea continued to grow! With their R/C car experience, Joseph Reed and his students were ready to move on to the *real* stuff—

Reading skills! It makes our editorial team nervous to know that MAN is being read in classrooms! Every issue must be perfect!

the stuff for which you need more than just a passing knowledge of math and science, and a great deal of manual dexterity. You've seen the pictures; you know they dared to rise!

"This is the greatest class in all the world."
—René Llamas

Mr. Reed sent more than 50 letters describing the program to manufacturers in the R/C industry, and he was "overwhelmed" by their enthusiastic response. "Literally hundreds of dollars worth of material poured in! I have these good people to thank for the success of my program.... The support from companies has been inspiring.... We feel as though we're part of one big family." When the UPS truck rolls up at Morningside, they joke that it *must* be making a delivery for Mr. Reed!

With the bonus of an $800 grant from the Los Angeles Educational Partnership and the classroom support of another teacher (Mrs. Koory), 60 fifth- and sixth-graders prepared for takeoff.

"All of the other classes get their science out of a book, but we do it the scientific way."
—Lydia Cabral

IDEA FOR IACOCCA!

If you're thinking the students let Joseph Reed do all the hustling on their behalf, you couldn't be more wrong. They were involved in all phases of the program, and that includes writing to ask for donations and to thank those who offered support.

Aaron Mansfield offered Lee Iacocca a practical idea to reduce engine wear—90 to 95 percent of which occurs on starting the engine. The eminent entrepreneur declined this young scientist's advice and sent Aaron's request to the appropriate people—who said "no"! Learning to accept rejection with good humor is an integral part of the project! "Each denial was seen by the kids as just another stepping stone to success."

(Read the sidebar to find out more about the students' efforts to help themselves.)

WE DARE YOU!

LOS ANGELES. Like the inhabitants of our other major cities, the people who live there know what the "drug war" is all about: it's about the safety of their streets and the well-being of their children.

Attempts to curtail supplies of illegal drugs have, so far, been dismal failures, so many feel that we should rely more on curbing demand, and in L.A., Chief of Police Daryl Gates started a program designed to do just that. Now found in 49 states, his Drug Abuse Resistance Program (DARE) inspires impressionable youngsters to say "no."

The idea for the quilt you see in the photograph came originally from a reading book used at Morningside School. The students wanted not only to raise money for their R/C project, but also to spread the word that drug abuse is bad news, so they quilted for cash—and their quilt makes excellent reading!

To raise the $80 they needed for materials, they babysat, took out the garbage and washed cars, and they now aim to raise at least $1,000 by offering their beautiful quilt in a raffle.

Each of the quilt's muslin squares bears an anti-drug message in the striking red and white colors of the DARE program, and although teacher Joseph Reed taught his pupils only a very basic stitch, their handiwork reflects the help given by talented parents who were pleased to share their skills with their sons and daughters.

Put together by Mrs. Molina, the quilt's message is clear: "Drugs can kill"; and the accompanying pillow (made by Mrs. Rios) tells us, "Mr. Reed's class DARES you!"

It's too late now to buy a raffle ticket, because the Chief of Police himself chose the winning ticket on January 9, but it's not too late to remember the quilt's message.

PLANE PROGRAM

Last year, as part of the school's Drug Abuse Resistance Program (DARE), Mr. Reed's class built a Leisure Amptique, and they now have eight planes under construction in two classes: six Astro Flite Mini Challengers; one Goldberg Electra; and an Airtronics Eclipse.

Our regular readers will appreciate the complexity of the logistics, here! How do they do it? Superb organization and teamwork! Since at least 30 studies have shown that cooperative learning works, the benefits of the approach are enormous.

You can't build a plane unless you can read the instructions and the blueprints; you can't pick out a 3/32x1/4 spar if you don't know your fractions; and you'll never get *anything* done if you don't learn to work well with others. Wiring, servo-mounting and covering—the myriad tasks that must be completed on a model—are all done by the students. Of course, while having a good time, they painlessly learn the skills that are now so necessary. The class motto? High *interest* leads to motivation, and motivation leads to success—and the students show an abundance of interest in building models.

GLUE GOOF!

Most modelers will admit to more than a few mistakes, but the greatest disaster for these youngsters came when "glue the balsa over the plan" was taken just a little too literally. A shamefaced group held up a huge blueprint to which they'd neatly glued three pieces of balsa, but they soon joined (and enjoyed!) the group's sympathetic laughter! I bet every one of our regular readers has done *much* worse than this!

PLANE SAILING?

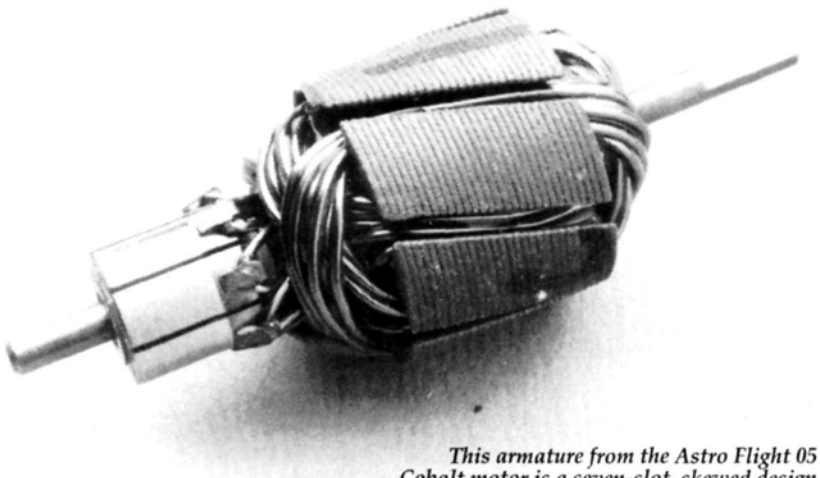
I can almost hear the skeptics among you thinking that the *real* proof of a modeler's expertise is in the flying, and of course, you're right. If your plane doesn't balance properly, if it's out of trim, or you don't know how to manage the transmitter, you're ready for ruin.

"So how was your first flight?" I asked. (Part of me was hoping for their success; but the other part was looking for good copy!) "Thanks to a surprise gift from Dave Brown Computer Products, we had no problems," said Joseph Reed. Having practiced with the computer simulator, there were "30 proficient fliers at the maiden flight."

(Continued on page 119)

BRUSH UP ON YOUR MOTORS

by STEVE POND

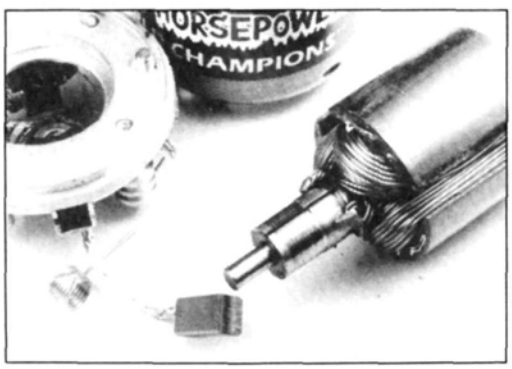


This armature from the Astro Flight 05 Cobalt motor is a seven-slot, skewed design with a considerably larger commutator than that of the Mabuchi-type motors, which use a three-slot armature.

Are you sure your motors are putting out all their available power?

FOR AS LONG as *Model Airplane News* has been published, planes have been powered by gasoline or methanol-powered engines. Recently, however, innovative modelers have tapped the R/C car market for the electrical accessories it offers, and they've started to use them in model airplanes.

Before there were planes specifically designed for electric flight, modelers either adapted the smaller gas-powered kits, or they scratch-built their own. Recognizing the demand for lighter, electric-powered designs, manufacturers have begun to offer a broader range of kits.



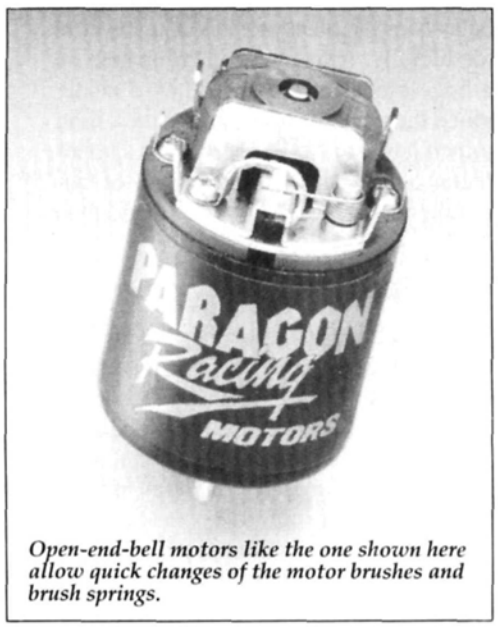
Model airplane fliers are increasingly trading in their glow plugs, nitro fuel and starters for electric motors, battery chargers and Ni-Cds. Of course, those who enjoy gas-powered flight still greatly outnumber electric-power enthusiasts, but their ease of operation and relative quietness make electric-powered planes increasingly attractive.

This surge in the popularity of electric flight has prompted me to write about motors. While I'm not an electrical engineer, I've been an R/C car racing enthusiast for more than 10 years, and I've worked with many of the motors that power electric planes.

Cobalt motors have been used with great success in model airplanes, but I'll focus on the 540- and 550-type motors, since they're most commonly used in electric-powered kits. These motors are inexpensive and are therefore generally a beginner's introduction to electric flight. A few proven maintenance tips will extend their life and improve their performance.

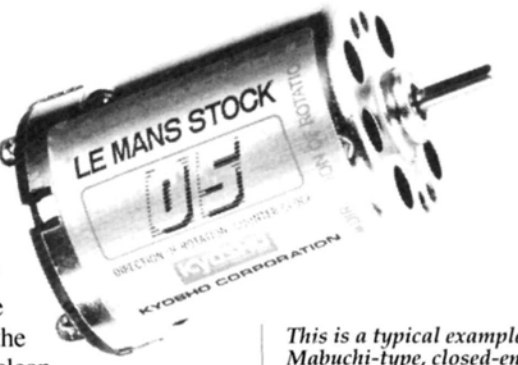
MOTOR MAINTENANCE

The 540- or 550-type motors are of the closed-end-bell variety, so the brushes and commutator aren't accessible unless you remove the end bell. (The commutator is the part of the motor that allows the electricity to be transferred from the brushes to the windings around the armature.) Much of a motor's performance depends on the condition of the brushes and the surface on which they run, i.e., the commutator.



Open-end-bell motors like the one shown here allow quick changes of the motor brushes and brush springs.

For maximum efficiency, the brushes should be in full contact with the commutator. The greater the contact area, the more efficient the transfer of current, and this will result in longer, more powerful flights.



This is a typical example of the Mabuchi-type, closed-end-bell motor that comes with many of the ARF electric planes and less expensive electric kits.

Look through the vent holes in the can toward the back of the motor; you'll notice that the brushes have a small contact area on the commutator. Left alone, the motor will perform adequately, but if you want a little more, there's a trick to it.

We used to dip a motor in water, then hook up the battery to hasten the break-in process. This sounds crazy, but the result was full contact (and quickly!) between the brushes and the commutator, and this enhanced their performance and efficiency. Regularly running the motor will also have this effect, but the hard compound used in the brushes won't allow it to happen quickly.

Apart from this, you don't have to do much to these motors, but regular maintenance is necessary to keep them running efficiently. The 540- and 550-type motors generally use oil-less bronze bushings on both ends to support the armature shaft. Unfortunately, the term "oil-less" is sometimes interpreted to mean that the bushings don't *need* oil. *Wrong!* Although the bushing material is impregnated with a lubricant, it still needs regular doses of a lightweight oil (3-in-1 oil, or one with a similar viscosity) to prevent accelerated wear. Put a very small amount of oil onto the bushing after every one or two flights, but be careful, because if you use too much oil, it will seep through the bushings and contaminate the commutator, and this will lead to poor performance.

CARBON CLEAN-OUT

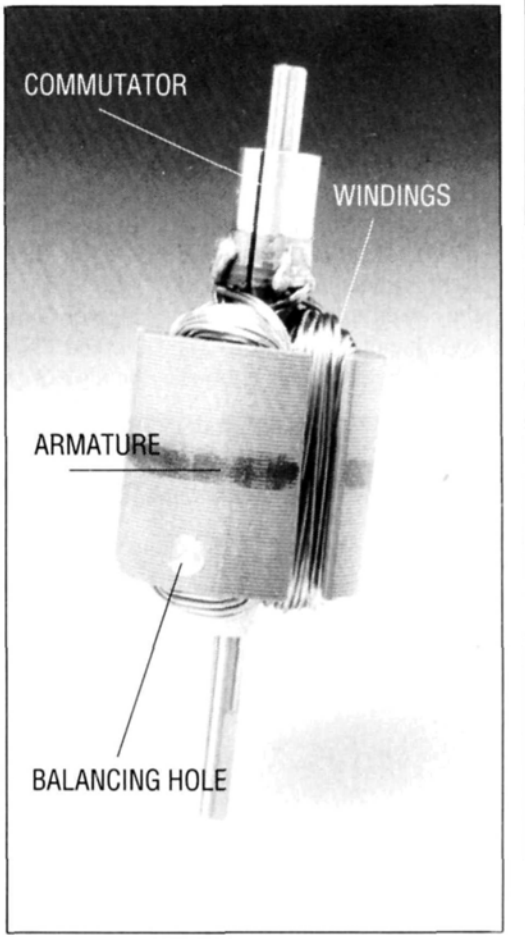
Finally, don't forget an occasional cleaning. Normal operation causes some arcing between the brushes and the commutator, and this leaves dark traces of carbon. Over time, carbon deposits cause the current to jump around on the commutator, and this hinders performance. To prevent this, occasionally remove the motor from the airplane and liberally spray the brushes and commutator with an electric-motor cleaner (available at most hobby shops). These cleaners effectively remove carbon deposits, but the active ingredient, carbon tetrachloride, harms plastics, glue and coverings, so be sure to take the motor out of the plane.

Some cleaners won't harm plastics, but those with a carbon tetrachloride base are the most effective. After using one of these sprays, be sure to oil the bushings, because the cleaners will remove any lubricant.

COOL & CHANGEABLE!

The open-end-bell 540-type motor is becoming increasingly popular for model planes. These motors closely resemble the closed-end-bell variety, but they're easier to maintain. This is the configuration used with high-performance motors in R/C car racing, and the same maintenance tips apply.

The open-end-bell design not only allows better cooling, but you can change the brushes when they're worn, instead of having to buy a new motor. This design suits performance-minded enthusiasts who can now experiment with different brushes or spring tensions and tailor their motors to particular applications.



The armature shown here is from a high-performance, open-end-bell motor. Note the balancing hole that ensures the best possible performance.

BEST BRUSHES

Brush choice is a highly subjective matter. You can't just see someone using a particular type and automatically assume it's best for you. Brushes are available in soft, medium, or hard compounds.

- **Soft brushes** are designed for applications that require short bursts of heavy current loading. The soft brushes are better conductors, but they wear more rapidly.
- **Hard brushes** are suited to low current draw at high rpm. They'll last longer, but they accelerate commutator wear.
- **Medium brushes** are a compromise between the other two, and I think they're ideal for flying. They're soft enough to provide good contact with the commutator, but hard enough to last a while.

(Continued on page 122)

SPORTY SCALE

TECHNIQUES

by FRANK TIANO

MEMORIES OF "THE BIG ONE"!

LIKE MOST OF YOU, I'm a real sucker for Mustangs. A few months ago, Brian O'Meara called to tell me that he'd committed me to putting on a flight demo for a few people in North Miami. "Just load the van, and you and Denny DeWeese can go fly your Jug and his ME-109 down at their field. These guys were fighter pilots in WW II, and they want to see our planes fly! One of them flew B-25s in the Pacific, and another is none other than Don Blakeslee!"

Denny DeWeese (ME-109), Frankie T. (P-47), Donald Blakeslee (Triple Ace) and Brian O'Meara (P-51). A private air show for one of the Air Force's greatest!

"Not the Don Blakeslee who commanded the 4th Fighter Group in England?" I asked. "Not Don Gentile's boss? Not the guy with fifteen-and-a-half air victories?"

"Yup," says O'Meara. "That's the guy!"

I told Brian that Denny and I would *love* to go down to Miami, but it sure would be great if we could show Don a P-51, too. Next thing I knew, a gargantuan crate showed up at the warehouse, compliments of one Brian O'Meara. I called Bri to see what was cookin'. "Here's the deal: go fly the Mustang for Blakeslee and send it back when you're done." Something about Mode I.

"OK, how about if I just fly down there and stay with you a few days and we all go down and fly?"

"Great idea. One more thing: would you and Denny mind fixin' up the 'Stang a little; it has a little hangar rash!"

"No problem. See you in a couple of days."

The story gets really simple from here. We went; we met; we flew; we ate; we left. We met Don Blakeslee and his wife, Lee; Dick Neubauer and his grandson, Ricky; and Victor Tatelman, the guy who drove "Dirty Dora," one of the B-25s with the blue bat painted on the nose. We've since become friends, and from time to time, we fly at Dick's field (which just happens to be a private airport with a 300x6,000-foot runway).

I guess you had to be there, but we all got chills listening to these guys. Vic Tatelman gave me original color photos of "Dirty Dora," so it's only a matter of time before I get cracking on a Ziroli* B-25 for next year's competition!

TOP GUNNERY

This all-black Nightfighter Corsair, built by Earl Aune, will be just one of the heavy-metal jobs at Top Gun in April.

IF YOU THOUGHT that Top Gun was hot last year, you ain't seen nothin' yet! Top Gun is picking up mini-sponsors like crazy, and the latest to jump aboard just happens to offer some of the neatest hobby tools I've ever seen. Griffin Manufacturing* has a fabulous mini-catalog for only $1. Aimed at the real craftsman, it shows many special knives and other cutting instruments. This company manufactures those pounce-wheel tools that you can use to make simulated rivets! Griffin also offer dual cutters and swivel-blade knives. Long, short, slim and fat—there's a handle and blade combination to suit any model builder. Look for more of this company in the pages of *MAN* and at Top Gun.

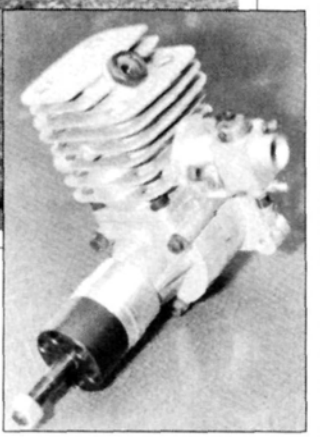
The Arizona Golf Resort (the headquarters hotel) is almost booked to capacity. If you've procrastinated, send a large SASE to me at FTE, and I'll send you a list of the other motel/hotel accommodations available in the Mesa area. We have rooms from as little as $28, so everybody who wants to come should be able to! From the way the pilots' information is coming in, I'd say that we're all in for a real treat. Take a look at Earl Aune's award-winning Corsair Nightfighter, and I think you'll get an idea of just how heavy-duty this contest is going to be. You know that *Model Airplane News* wouldn't be associated with any event that wasn't absolutely first-class!

Doctor Farrell and his latest: a 10-pound, 81-inch, fun-scale F-82 with two O.S. .40s; a great kit-bash subject.

STUNNING DECISION?

Speaking of Mustangs, my ol' masochistic buddy from Kingston, NY, has struck again. In a record 15 days, Timmy Farrell has produced a fun-scale P-102 or F-82 Twin Mustang, whichever comes first. I don't have any real details except that it's about 70 inches; it uses two .40 4-strokes, and it doesn't have tracts or flaps. Will *Model Airplane News* publish the plans? Only the Colonel knows.

If you want a few more horses under the cowl, listen up. A Webra Bully mated to an O.S. 8BI carb will turn an 18x10 Dynathrust prop at 9,000rpm! On 5-percent nitro and 5-percent castor-oil fuel from Red Max*, this engine is an absolute brute! Yes, I know it has 2.2 cubes, but believe me, it acts like a big old Zenoah! Barton Machining,* the company that produces all those scale landing-gear struts, makes an intake manifold for the



Webra Bully is available in glow or ignition. This 2.2-cubic-inch powerhouse easily flies a 35-pound aircraft. O.S. 8BI carb on Barton manifold replaces stock carb.

Bully, and it allows easy priming. I'll testify that this motor will haul around any 25- to 30-pound slug you have in the garage; in fact, it flies Gene Barton's 38-pound Skyraider as if it only weighs 20 pounds! Best of all, now that Circus Hobbies* has put its products through a normal chain of distribution, you can buy a Bully from your local hobby shop.

Mike Bacon strikes again! An excellent way to preview your color scheme. Mike suggests 1/32- or 1/48-scale models whenever possible; they're easier to work on! Good plastic kits are available at most hobby shops.

PLASTIC FANTASTIC

By now, I've mentioned Mike Bacon's name so much that you should all recognize it. He's a freelance artist who lives and dies for airplanes and TacoBell. Mike has done numerous drawings and illustrations for my column, but his latest efforts are really something to see. Take a look at the Dave Platt* Japanese pilot that Mike prepared for me. Isn't it a work of art? And we all know how important a good-looking pilot is, right?

Next, take a peek at the plastic KI-84 that Mike did to give me an idea of what my new R/C scale model would look like when it was finished. What a terrific idea! If you do up a plastic kit like your radio model, you'll know exactly how the color scheme will look to the judges or to your friends. Most hobby shops can get any plastic kit you want. Try it; you might be pleasantly surprised.

Speaking of my KI-84, there's a picture of part of it in here somewhere. I've replaced the navy wing with a more scale-like version. This is built from the Don Smith*

Mike Bacon's beautiful rendition of "Sya' Fuccanarra," the Platt 1/5-scale pilot that Frank Tiano will be using in his new KI-84. A pilot can make or break a good airplane.

plans that I mentioned a few issues ago. Everything's going together well, and the model is starting to take on some character. The KI-84's nickname was the "Frank," so I'm sure to have a few pleasurable moments with this one!

Arrange nine Williams Bros. cylinders around a dummy crankcase, pour a rubber mold, fill the mold with resin—and look what pops out!

Front end of KI-84 with the 1/5-scale resin engine installed. A little paint, a little patience, a little tubing and a little wire make for big improvements!

RESIN RADIAL

Speaking of Franks, I just happen to be one, and without too much fanfare, I'd like to show you something I make for my scale buddies on a one-to-one basis. It's a cast-resin/microballoon, 9-cylinder radial engine in 1/5 scale. One photo shows the original plug sitting next to the finished resin product. The other picture shows the finished engine after it has been dolled up and a plywood backing added for mounting. I use pieces of aluminum tubing for simulating the pushrods, bits of white nylon material for spark plugs, and some red wire for the leads. Quite

(Continued on page 130)

HELICOPTER SECTION

PHOTOS BY DICK TRISTAO

GMP REBEL

by DICK TRISTAO

REVOLUTIONARY approaches are infrequent in the model-helicopter industry, but Gorham Model Products'* latest endeavor isn't called the "Rebel" for nothing! This new release offers a way for airplane drivers to become helicopter recruits.

Although fixed-pitch rotor systems are where all model helicopters began, current materials and technological developments have brought this system up to modern standards. Many modelers have resisted the urge to explore helicopters because of the current dominance of expensive, complex machines and their specialized radio, engine and electronic needs, but GMP has kept costs down.

More than 12 years ago, John Gorham launched his career as a model helicopter manufacturer. The GMP

The influence of the Cricket is apparent in the drive-train areas. Note looped wire from engine lug to main chassis; this is recommended by GMP to curb electrical-noise glitches in AM radios.

Ample radio compartment accepts nearly any size system. The canopy slides onto the bottom plywood tray and snaps over the short and long rubber-tipped posts, which you can see behind the servos.

An enlarged Cricket? Sure, but the larger size brings big improvements

Cricket (see *MAN*, July, 1987) was a small, simple, inexpensive model that allowed people to experiment with helicopters without mortgaging their houses. It was a success and continues to sell well today, so why the Rebel?

John Gorham also flies R/C airplanes and, during his frequent forays to Southern Californian flying sites, he noticed that most modelers use .40 to .50 sport engines. The Cricket requires a .25 to .30, and most of these engines cost as much as, or more than, a good .45. Many modelers weren't interested in buying a Cricket because they didn't want to buy a new engine when they had a spare .40 at home; they didn't want to buy specialized radios, either. John went to the office, poured fresh oil into the lamp and spent long hours hunched over the drawing board.

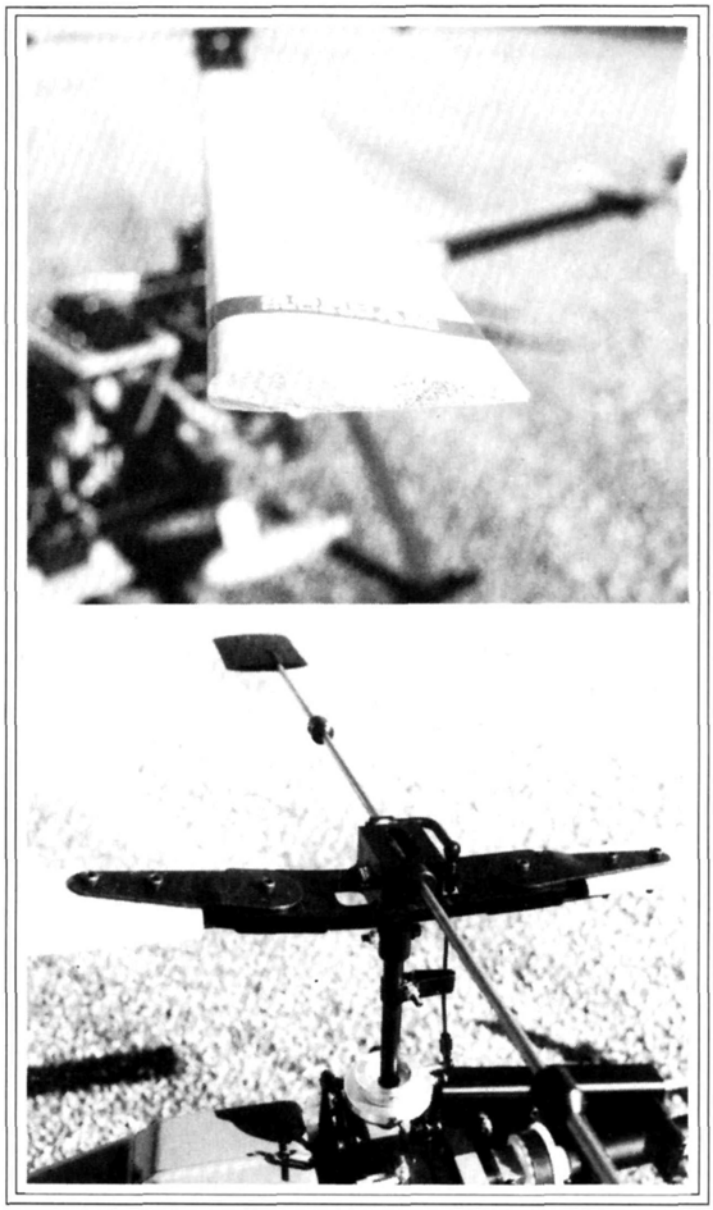
He borrowed successfully engineered and time-proven Cricket components (this kept manufacturing costs low), scaled-up the chassis dimensions, re-engineered the assembly sequence, added a few space-age plastic parts and a new rotor-blade airfoil, and the Rebel was born.

THE KIT: The pleasure derived from building anything from a kit is in direct proportion to the quality of the instructions and parts provided. For me, assembling the Rebel was 95-percent trouble-free. (The other 5 percent is accounted for by my choice of engine and a couple of pushrods that drove me nuts.)

Instructions are geared toward beginners: assembly steps are matched to numbered parts, and exploded views clearly illustrate all parts and their locations. (Metric hardware must be sorted.) One page of the instructions is devoted to nuts, bolts and washers, and a printed metric ruler helps you select parts of the right lengths and sizes. Correction sheets are stapled inside the front cover.

If you follow the steps carefully, you won't have problems; if you don't, you'll have to redo a stage or two (I did!). Also included are a parts list with prices, colorful decals, a warranty card and a color photograph of the completed Rebel.

All parts are bagged and numbered to match the assembly sequence. The aluminum chassis parts are anodized black and require no preparation before assembly. Tissue-wrapped canopy halves are nestled in protective box sections.



Top: Thick, blunt rotor blades are the secret to Rebel's collective-like performance. Matched weight blades minimize balancing chore. Bottom: Blade on left is held up to illustrate the flexibility of molded-plastic seesaw.

ASSEMBLY: The engine is needed first, so the cooling-fan/clutch must be assembled first; this takes patience! The fan/clutch/start shaft must be aligned for the power train to run smoothly. (I had to re-drill the fan-shaft hole to the next drill size.)

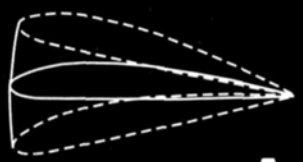
Next, I held the engine in a vise and held the fan in place with a slightly snug prop nut, and I then lightly tapped the side of the fan hub with a ham-

At the Fall '89 fun-fly in Merced, CA, a line of modelers followed John Gorham's Rebel to the flight line for a turn on the sticks.

mer handle until it looked centered. I then turned it by hand while sighting along the fan's side in relation to a reference pointer. When centered, the nut was tightened and the clutch was bolted on. Again, checking against the pointer proved all was turning as well as possible without a dial indicator. (This step is probably the most time-consuming.)

My first encounter with the "other 5 percent" came when I tried to mount the engine. I chose a Fox*.50 BB R/C because it's a popular airplane sport engine. The .50's case is slightly wider than most mid-size engines, so I had to file the inside of the engine-mounting plate and re-drill the bolt holes. Most .40 to .50 plane engines should bolt into place without modification.

The plastic cooling shroud is cut and assembled in this step, because everything must be mounted into the main chassis as a unit.



A DEGREE OF DIFFERENCE BETWEEN FIXED AND COLLECTIVE PITCH

WHAT'S THE DIFFERENCE between fixed-pitch and collective-pitch helicopters? Fixed pitch means that the main rotor blades are locked at a given pitch, or angle of attack; in the Rebel, it's approximately 4 degrees. Lift is a direct result of rotor/engine speed. To climb, the rotor/engine speed is increased by adding throttle; to descend, throttle is reduced to slow the rotor, and this allows gravity to overcome lift.

Collective pitch means the blade pitch can be varied by servo control through a range of -4 to +10 degrees (or more), while maintaining constant rotor speed because the throttle is always open more than half. Collective pitch allows instant altitude changes, but in a fixed-pitch helicopter, there's a slight delay while the rotor speeds up or slows to a new setting.

Many newcomers have had little experience with fixed pitch. Collective machines allow us to take a lot for granted, e.g., cool-morning/hot-afternoon flying. With a collective machine, you just move the collective stick a little more to lift off. With fixed, you need more movement of the throttle stick (and the consequent rpm increase) to get the machine off the ground. Why? It takes more pitch to lift off in thinner (warmer) air. Because the pitch is fixed, the blades must travel faster to produce the necessary lift.

A helicopter at sea level and 70 degrees air temperature may require 4 degrees of pitch to hover. At 100 degrees, it may take 6 degrees of pitch to accomplish the same hover. On a collective ship, you simply add a little more collective trim when the rotor over-speeds and fails to lift off at a point where it usually does.

A fixed-pitch model will sit there because it doesn't have enough pitch to do the job under those conditions. To fly in warmer or thinner air, you must bend more pitch into the blades (mechanical collective), or keep increasing rotor speed until you hover.

Fixed-pitch helicopters (e.g., the Cricket) have tiny, thin rotor blades that must be turned at high rpm (1800 or more) to achieve stability and lift. The Rebel's larger size and longer, thicker blades allow a lower blade speed (approximately 1500 to 1600rpm) and a wider lift envelope. The Rebel isn't as sensitive to atmospheric changes, but the throttle-stick hover position must be increased slightly as the temperature rises.

Last fall, at the Fun Fly in Merced, CA, several Rebels were flown throughout the day without changes in pitch or trim, and the temperatures ranged from early morning lows of around 60 degrees to afternoon highs of around 100 degrees!

If you're going to fly fixed-pitch helicopters, you need to know these facts of flight!

Top: GMP packs a lot of model into a tiny box! Bagged components match assembly steps in the well-illustrated manual. Excellent parts fit made assembling Rebel easy and enjoyable. Bottom: The tail-drive wire is fully brass-tube supported inside tail tube. It runs smoothly because it's a straight shot to the tail transmission.

To produce effective air cooling, the clearance between the fan and the shroud must be minimal. Rather than making holes at the pre-molded dimples in the shroud and installing the mounting-bracket hardware, I waited until the engine and drive belt were installed and aligned. When I positioned the fan shroud, I saw that the location of the top dimple was fine but that of the bottom one wasn't. This might not happen with a different engine, but it's worth trial-fitting so you don't make unnecessary holes in the plastic shroud.

During the next few steps, pay close attention to the building sequence. They take less time to do than installing the engine, yet represent more than half the steps in the total assembly. (The influence of the Cricket is noticeable throughout these steps.) The 1/8-inch-thick mainframe is a single slab of aircraft-grade aluminum alloy onto which all drive-train components are mounted. The shafts, bearing blocks, pulleys, bellcranks, plastic links, swashplate, etc., are right out of the Cricket parts bins.

Installing the toothed belt from the clutch bell to the main-drive pulley introduces the first noticeable drag into the turning parts. Check the pulley alignment and set the specified amount of tension into the belt; the system will turn properly, but stiffly. This is normal and will diminish by about half after the first few engine runs.

Test your installation by turning the system at the clutch bell rather than at the rotor head; after all, this is the direction in which power is transferred. If you turn the system at the head, it will feel as though gravel is mucking-up the works!

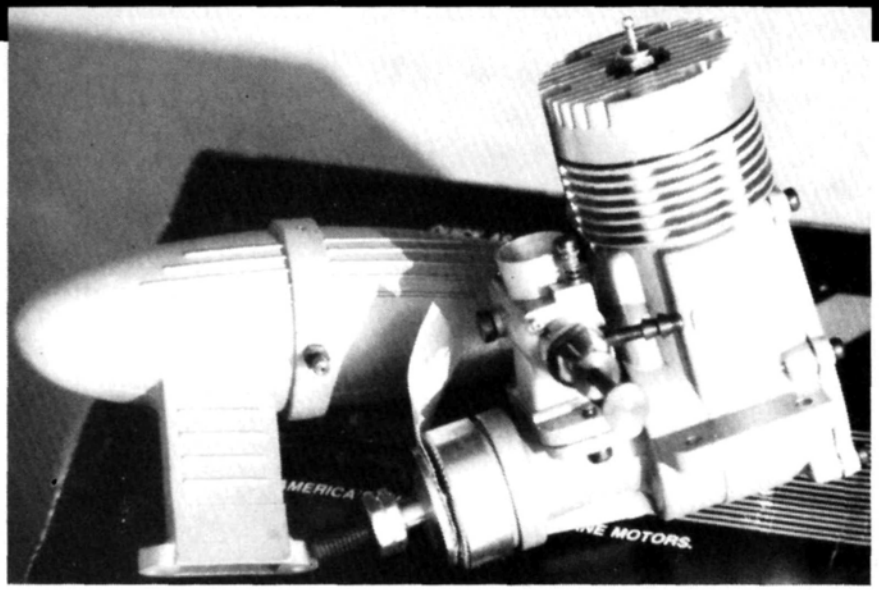
Power is transferred to the tail rotor through a fully supported wire shaft. A brass tube is inserted into two foam dowels that are then glued to the inside of the tail boom with CA. The wire shaft is first mounted into the tail-rotor transmission collar. Smear some lightweight grease onto the shaft, then slide the shaft into the brass tube. Secure the transmission at one end with a clamp; at the other end, a couple of two-piece plastic collars hold it to the mainframe.

The large main pulley's shaft captures the drive wire and locks with a setscrew. If the wire is a little too long, snip off little pieces until it seats properly (the tail tube should clamp into its proper location without bumping the bottom).

The tail-rotor transmission, related linkages and blades are imported parts, but they'll be replaced in 1990 kits with GMP's own designs. (This is the final step in making the Rebel—and all GMP helicopters—100-percent American-made.)

High-quality plywood is cleanly die-cut to form the trays. Assembly is quick if you use CA and a little spray lacquer to fuelproof the parts. The upper servo tray will accommodate any size servo and will be custom-fit during assembly. It also has a pre-cut slot for the radio's on/off switch. The bottom sheet holds the throttle servo, receiver, battery pack and gyro; it also serves as the side rails onto which the canopy slides. To save weight, the plywood is thin here; some may prefer to beef-up the trays a little, although the supplied size works well.

Before being glued, the clear-plastic canopy halves



FOX .50

SINCE 1943, WE'VE HAD Fox engines, but let's look at a war baby's descendant: the Fox .50 BB R/C.

American products always seem to suffer the dinosaurs' plight, but flag-waver Duke Fox is one of those business people whose continued success comes from a down-home tradition of offering a good product at a reasonable price, with no-nonsense service to back it up.

This is the first Fox engine I've owned and, believe me, it's an eye-opener! Since the subject for this powerplant was GMP's Rebel, it seemed appropriate to select a home-grown engine—one that isn't often mentioned with helicopters.

The Schnuerle-ported Fox .50 R/C I selected is from the lighter-cast, tall-backplate, B-Frame Series. It has a ringed piston for easy starting and a two-piece button head. Duke contends the button head allows more accuracy when machining the combustion chamber, and it also provides stronger materials for the glow-plug thread area. (The latter part of this combination should take care of the pilots who snap fire walls off their airplanes while installing a new glow plug!)

In this engine series, the crankshafts are particularly strong and have a 1/4-inch-diameter crankpin that's similar to those on competitive engines in sizes of .60 and more. The larger pin handles the loads imposed by the Quickee .40 ABC version that uses the same bottom-end components and turns 18,000rpm before launching! The only helicopters with that kind of rpm have already crashed, but I'm sure that traditional rotor speeds in a healthy model will do little harm to this engine.

The carburetor is similar to those on most engines, except for its flange mount, which is another Fox innovation that eliminates potential front-crankcase distortion. Two adjustment needles, combined with a rotating barrel, meter the nitro into the awaiting parts. Instructions are even included for modifying the low-speed needle to custom-tune idle and mid-range mixtures to suit personal taste or power demands.

The overall fit and finish of the test engine was very good. I noticed some external casting flaws (e.g., those on the pits and divots), but what the heck—they don't affect the inside! Outside physical dimensions resemble those of most .50s. Because it shares a crankcase with the B-frame .40s and .45s, it's physically larger than competitive engines of the same displacement.

All Fox engines are test-run before shipment, and there's a little tag with a technician's name on it and traces of castor oil to prove it. The instructions tell you to bolt your Fox engine into your airframe and fly it immediately! A very effective, tilt-down muffler is included, as is a 2-inch, polished, cast-aluminum spinner. Also included are a detailed instruction sheet, a parts order form with return-mail envelope, Fox Power decals and a mini catalogue describing the entire engine and accessory line.

Engine repair costs are detailed in the instructions—surely the best values in the industry. At no time will repair costs exceed 50 percent of the retail price of a new engine! It doesn't matter if the engine arrives at the factory disassembled or still covered with sod; it will be rebuilt, test-run and restored to factory specs for *only* the cost of the parts (no labor charges!), up to a maximum of 50 percent of the price of a new engine. There's no longer any reason to toss out the broken engine that nearly traveled to the center of the earth!

How does the Fox run?—smoothly and reliably. This engine starts easily at idle—hot or cold—and produces abundant power. No horsepower figures are given, but you can tell it's strong, especially when running on 10- to 15-percent-nitro fuels. It will swing the same prop as most .61s do, and it will nearly match their rpm, as well. Throttle response (which is especially critical in a fixed-pitch helicopter) is excellent, so it certainly should be equally happy swinging some mahogany behind the spinner.

Duke Fox now offers most of this engine line in versions with expanded heat-sink heads—specifically for helicopters. The reliability, tough construction, incredible power and smoothness of these powerplants warrants a closer look for future rotary-wing projects. Besides, they're made in the USA, and that rates highly in *my* book!

are trimmed along the protruding flange. Two additional molded pieces that make up the canopy-mounting rails are cut and glued inside their respective canopy halves. There's only one way to fit them, so this step is almost goof-proof. Final mating and gluing of the halves is then completed.

The canopy is attached by sliding it onto the bottom radio tray and snapping the canopy back over the rubber-tipped posts that protrude from the mainframe. Its hold is very solid. I painted my Rebel with automotive acrylic lacquers and added a clear coat of urethane. The stars came from Coverite's* graphics system.

The Rebel's main rotor head and blades are revolutionary. Unlike the Cricket version, which uses multiple, machined, metal parts, the Rebel's seesaw is molded in high-tech plastic. This lowers the parts count and eliminates teetering springs and rubber dampeners. Two ball bearings support the feathering axis (blade angle), and the plastic itself acts as the flybar-bearing surface. Plastic paddles and adjustable weights complete the flybar control functions.

The main rotor blades are of traditional construction: hardwood leading edge and balsa trailing edge. The blades are "weight-matched" for minimal balancing and required no additional trim tape, even after being covered.

The Rebel is approximately two-thirds the size of GMP's Legend. Weight is in the same proportion. Modelers starting with Rebel won't have to re-train their visual perspective if they move up to more sophisticated machines.

Airfoil design and blade weight can dramatically affect the performance of a fixed-pitch helicopter. The flat-bottom blade has a thick cross-section and a fairly blunt leading edge. Pre-bent steel plates attach the blades to the seesaw at the proper pitch angle. Besides snugging the nuts so the blades can pivot if bumped, no other adjustment is needed at this time.

The Rebel was completed with the installation of the radio and control rods. I used a Futaba* FM Conquest 6-channel system and a homemade 1200mAh battery pack. I pulled four Royal* Mini-Titan servos from my spares box, and they fit neatly. The correct servo-arm length to achieve proper control travel is given in the instructions.

The remaining "5 percent aggravation" surfaced as I tried to attach the control rods. The long, tail-rotor control rod is made of soft, copper-like wire that runs inside a plastic tube. To fit into the kit box, the wire was curled into a half circle. Much to my chagrin, I couldn't straighten it enough to eliminate dragging within its sheath. I finally replaced it with a blue Gold-N-Rod* to achieve the smoothness I wanted, but a more patient modeler could probably make it work.

Three servos sit high in the cabin area. They all operated freely until the canopy was installed; then the roll servo arm hit the canopy when traveling toward the front. I trimmed it off just past the pushrod hole, and this allowed it to clear the canopy edge, although it still rubbed slightly. Compared with other servos, the servo arms sit a little high in the Mini-Titans, so most should clear OK.

The final two items I in-

Control response is crisp and responsive—something fixed-pitch machines of yesteryear didn't have.

stalled were a GMP whip antenna and a GMP gyro. The latter is highly recommended and will save the beginner more than its cost in repair parts. It's the least expensive gyro, and the one I use in the Rebel is more than five years old and hasn't once failed.

The Rebel's finished weight was just over 6 pounds—right in the middle of the specified range.

PERFORMANCE: The Fox engine started easily and almost at a perfect needle setting. First throttle run-ups were limited to getting the Rebel light on the skids; this allowed break-in time for both the engine and helicopter. Leaning the needle and advancing the throttle produced the first lift-off slightly past half stick, with the engine screaming.

The engine broke into 2-stroke at lift-off; it was past half stick and revving quite high, so I knew there wasn't enough pitch in the main rotor blades. After I had shut it down, I measured with a pitch gauge and found that the pitch was approximately 1 degree too low. I twisted the blade holders to the recommended 4 degrees, and this allowed the Rebel to lift off right at half stick with a clean 2-stroke run. Minor trim adjustments resulted in a calm hover.

Control response is crisp and responsive (something the fixed-pitch machines of yesteryear didn't have). The feel *does* parallel that of most collective machines I've flown. There's no discomfort and no need to anticipate cyclic corrections; in fact, I over-controlled for the first few minutes. Throttle response was still a little ragged because the engine was new, and I had to play the throttle stick quite a lot.

The second session produced improved results because the drive train had loosened up considerably, and uniform throttle transition was coming from the engine. Half-throttle lift-offs became smooth and required only minimal throttle changes to maintain a stationary hover. To hover the Rebel, you must anticipate the lift changes needed to maintain altitude. Small applications or reductions of power aren't immediately noticeable, but they do have an effect on the vertical position. You must apply/reduce a little throttle; wait a second for the result; then continue if more is needed.

Ground-effect, or the air cushion beneath the rotor, is more noticeable with fixed-pitch helicopters. If you reduce power slightly to descend from above a 3-foot hover, the Rebel will stop about a foot off the deck. The air bubble will hold it there until power is reduced further.

GMP developed a rotor-blade airfoil that complements this operational envelope. To provide high lift at relatively low speed, part of the design employs a thick, flat-bottom airfoil. Opposite that, the blunt leading edge presents a lot of drag surface, so when engine power is reduced, the blade slows quickly. Vertical response is slower than collective, but fast enough for solid control. It works quite well.

Experienced helicopter fliers are probably wondering how the tail rotor works, especially without automatic tail compensation in the plain-Jane radio. Remember that torque is created on the Rebel via the spin-up/down speed of the main rotor. Because the tail rotor is linked directly, it, too, speeds up or slows down, and this provides automatic compensation. Rapid throttle changes cause some tail swing, but this is dampened quickly by the gyro.

During forward flight, cyclic control of the fixed-pitch machine differs little from collective. The Rebel exhibits positive response and never feels as though it wants to wander or be soft to directional command; the tail rotor feels the same. Again, the most noticeable control area is throttle versus collective; hearing the engine rpm change takes getting used to. Hearing a dramatic throttle reduction with a collective bird usually increases the pucker factor ten times! Get used to it on the Rebel; this is one of the ways to get this angel down from the heights.

Slow-flying descents are pretty and may find the throttle stick somewhere around fast idle. This isn't uncommon in fixed-pitch machines and clearly illustrates that rotors don't have to turn 2,000rpm to be controllable. The Rebel can be flown down from altitude just like a collective bird, and it can even perform the rapid descents. The Rebel requires some finesse at the bottom—unless you want to stress-test the landing gear! This is where timing and throttle-stick skill differ between the two control modes.

Some think model helicopters must tumble around the sky eliciting "oohs" and "aahs" from spectators or their performance isn't worth mentioning. The Rebel was designed to be a docile flier for inexperienced fliers, so it isn't for daredevil antics. Aerobatics? Mild, only; loops are easy; 540-degree stall turns are snappy, but rolls take moxie. All components are accessible, so maintenance is simplified. The Rebel allows newcomers to learn two things about helicopters: how they work and how to fly them.

In this sense, GMP's new machine is a trainer, but is it a good model for beginners? Yes, because it doesn't require special items for proper operation; it's inexpensive and it performs as well as some of the more sophisticated machines. The isolated beginner will achieve a varied level of success with the Rebel, owing to its well-engineered behavior. It is, however, wise to seek help during the first

(Continued on page 130)

Helicopter Challenge

by CRAIG HATH

Build the machine right with the proper tools

PHOTOS BY CRAIG HATH

The full array of hand tools shown here can really help during kit assembly.

LAST MONTH, I discussed some of the essential items needed for this sport, but there are other things to consider buying if you want to make building and flying your helicopter a little easier. If you're going to build your first machine from a kit, a few special hand tools will speed the process.

Practically every R/C helicopter kit uses metric hardware. The popular screw sizes are 2, 2.5, 3 and 4 millimeters with Allen-style socket heads, and the corresponding hex-key wrench sizes are 1.5, 2, 2.5 and 3 millimeters. The most commonly used size is the 3mm screw with its 2.5mm wrench.

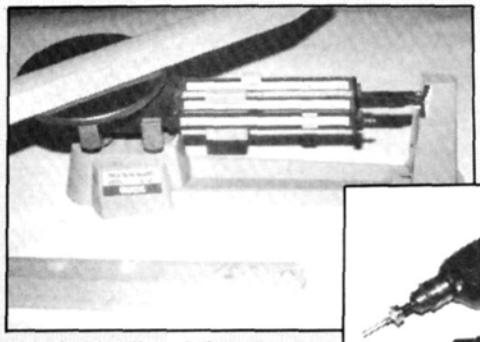
Most kits include a set of hex-key wrenches, but you should also buy a 2.5mm Allen screwdriver with a ball end. These popular drivers are made by Du-Bro, Yale Hobby Mfg., Thorp Mfg. and Bondhus. The Yale and Thorp drivers are hardened, and they're available with or without the ball end. Ball ends permit turning the screw with the driver held at an angle, and this makes certain areas easier to reach.

The popular nut-wrench sizes are 4, 5, 5.5 and 7mm, the 5.5mm being the most common size for our use. Finding 5.5mm wrenches and nut drivers can be difficult, but hobby shops that specialize in R/C car accessories may carry them. I've had good luck with 7/32-inch wrenches and nut drivers. They fit almost exactly, and they haven't damaged any nuts on my helicopters. A set of Sears ig-

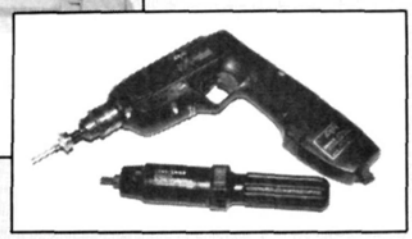
The Advanced Workshop

Now that I've covered the basics, it's time to look at the goodies that will simplify some steps and make your project look more professional.

The rage for cordless tools is obvious, and without some of the real handy cordless tools and accessories that I have in my shop, I probably wouldn't be able to start as many projects as I do. Try to find a 5.5mm- (or 7/32-inch) and 7mm- (or 9/32-inch) socket attachment to use on all the nuts that must be tightened when the machine is being assembled (or loosened when it's being torn down for repair). Since most small Phillips-head screws are too small for cordless-screwdriver attachments, I cut the end off a small Phillips-head screwdriver and chuck it into my cordless drill. This comes in handy, especially when you're trying to install servos, since this step uses about 20 screws.



Left: Triple-beam balance is used to measure accurately and compare the weight of the rotor blades.

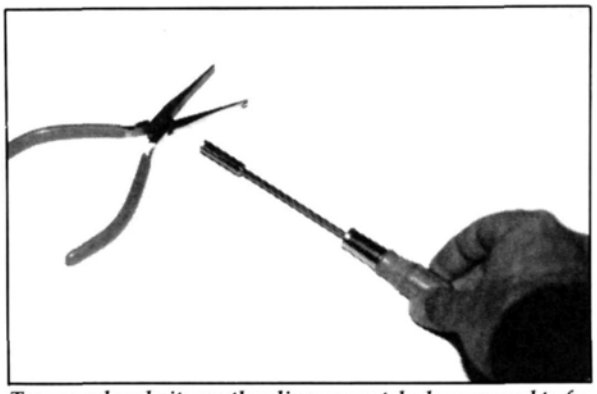


Right: Cordless drill and screwdriver: two of the most frequently used tools in the shop.

To build with real precision, you should have a dial indicator and dial calipers to check parts for roundness and trueness. These items detect vibrations in parts that spin at high speed, i.e., clutch-start shafts, main shafts and gears. A drill press is also useful, if you want to add after-market parts to modify your machine. Although not as precise as a drill press, a hand drill will do the same job.

For a great-looking finish, use an air compressor and some painting tools, such as a touch-up gun and a good airbrush. You'll be able to spray on some of the more exotic finishes, like epoxy, automotive lacquers and enamels. You'll also need a good respirator; pref-

A good pitch gauge is an absolute must. This model is from Miniature Aircraft USA, and it has a full 30-degree pitch range.



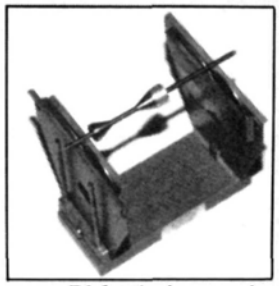
Two very handy items: the pliers are notched on one end to facilitate universal ball-link removal, while the driver is designed to fit over the end of the universal link for turning onto the threaded rod.

nition wrenches will also come in handy. Even though the set is made in imperial sizes (inches), many of the wrenches compare closely with the metric sizes you'll need.

Other tools to consider for your shop are jewelers' screwdrivers. Most of the metric Phillips-head screws require a screwdriver that's slightly different from our American hardware. Look for a set of small screwdrivers made in the Orient; they fit the Phillips screws better and minimize damage to the screw heads. Kit manufacturers usually supply tools that are hard to find, or they'll tell you where to buy them. Find out which special items are required so that you'll have them when you need them.

A good pitch gauge will allow you to measure your pitch curve accurately once you have your machine set up and trimmed. It's important to record this measurement so that you can repeat this setup after a crash.

That wraps up this month's column; next month, I'll discuss building tips. See you then. ■



Right: An inexpensive touch-up gun completes the finishing-tools "wish list" and makes many painting jobs possible (like automotive finishes, etc.).

Left: The High Point balancer can balance almost any moving part (a necessity for precision balancing).

With an air compressor, a good airbrush is vital. Shoot your base color with the touch-up gun, and apply trim color with the airbrush.

erably the type with replaceable cartridges to protect your lungs! My air compressor is one of my most valued tools, since it can operate so many types of air tools. For most jobs, you can get by with a 1hp model with a 12- to 20-gallon tank. Anything much smaller than this won't handle the load efficiently.

To achieve absolute perfection in balancing rotor blades and parts, use a High Point balancer and a good beam balance-type scale that's accurate to within at least .10 grams. Kit instruction manuals will often suggest an alternative to using these two items, but the results won't be as good. High Point Products manufactures a few accessories that make its balancer even more versatile, and attachments are also available for balancing the entire rotor head!

That should get your shop into fairly good shape. This is by no means intended to be a complete guide, and I'm sure that I've forgotten something. At any rate, you now have some things to put on your shopping list. ■

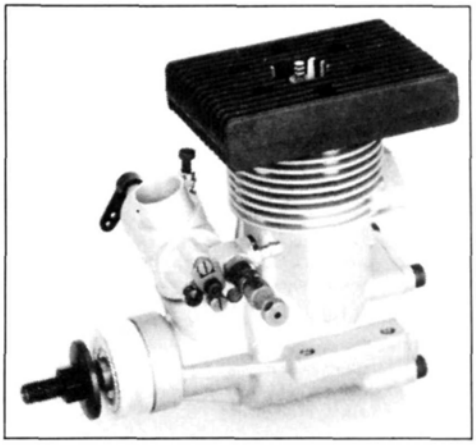
ROTARY-WING ROUNDUP

HOBBY DYNAMICS JR PCM-10 Radio

Hobby Dynamics Distributors' JR PCM-10 computer radio has a touch-panel switching system that's user-friendly. Just a touch on the display panel calls up the function you need. You'll see all the necessary data displayed on the screen, and by simply touching the desired adjustment box or switch box, you can change the operation. By using this touch-screen method, you'll feel just as comfortable adjusting your transmitter as you did with your analog system. The figures and graphs on the display screen show what you're programming your radio to do. The PCM-10's features include dual rates and exponential, ATS revolution mix, gyro-sense adjust, keyboard locks, servo-reversing, pitch curve, travel adjust, stunt trim and failsafe.

For more information, contact Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

GREAT PLANES O.S. .61 RFN-H



O.S. Engines now offers a new engine that's ideal for American-style flying because it gives consistent power and torque throughout the rpm range. The .61 RFN-H weighs 20.5 ounces and has an rpm range of 2,000 to 16,000. It produces 1.7bhp at 16,000rpm, and this allows pilots to perform tight loops and rolls without hesitation. The .61 RFN-H is available in ringed or ABC versions.

Part no. .61 RFN-H; price: $289.95

Part no. .61 RFN-H ABC; price: $299.95

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.

R/C HELI SCHOOL HELI CLASSES

The Radio Control Helicopter School at Ernie Huber's R/C Flight Training Center in Crescent City, FL, offers a variety of courses for R/C helicopter enthusiasts. The Introductory School is for those new to R/C, or those who have mastered the basics of R/C flight, but are ready to tackle the sophistication of R/C helicopters. Intermediate School classes are for those who can fly helicopters but want to fine-tune the skills needed to make the hobby even more enjoyable.

A five-time national R/C helicopter champion, Ernie Huber now devotes all his time to teaching at his R/C Flight Training Center.

For an informative brochure, send $2 to R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112.

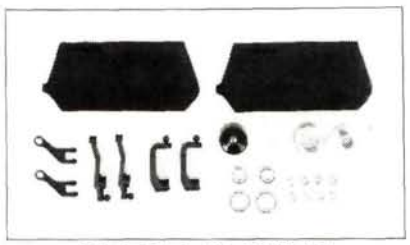
X-ACTO Sanding Stick

The X-Acto Sanding Stick has a tapered-head design and a rotating belt mechanism that allow you to reach areas that are usually difficult to sand. The streamlined Stick fits your hand for comfortable, secure control. Replacement sanding belts are available in three grits: extra fine, fine and medium.

Product no. HX-004

Price: $2.95 (X-Acto Sanding Stick and a replacement fine-grit sanding belt). Replacement Sanding Belts: $2.95/package of five.

For more information, contact Hunt Manufacturing, 230 South Broad St., Philadelphia, PA 19102.



GREAT PLANES Kyosho Concept 30 SE Upgrades

Now, Concept 30 DX owners can easily upgrade their models to Concept 30 SEs. Most of these parts will make a heli respond more quickly, so they aren't recommended for beginners. Add them one at a time to gradually familiarize yourself with their flight characteristcs.

Parts and their numbers: SE Stabilizer Blades (KYOE1330); Mixing-Lever Set (1310); Mixing-Lever Bearings (1320); Shaft Guide (3200); Pitch Slider Set (2260); Pitch Slider Bearings (2270); Stabilizer Seesaw Bearings (1300).

Price: $139.60, for all the SE upgrade parts

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

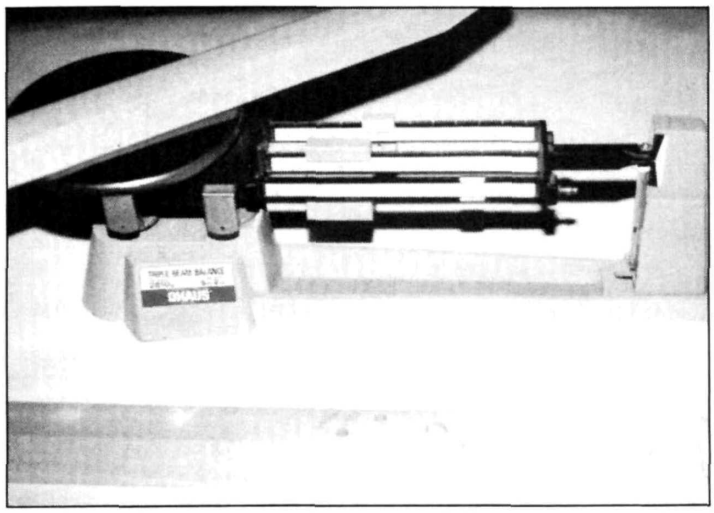
BUILDING AND BALANCING Weighted Rotor Blades

by CRAIG HATH

A SMOOTH-RUNNING, vibration-free helicopter is something all R/C heli pilots strive to achieve. The rotor blades get more attention than any other part, but they're also the subject of confusion, especially when it comes to finding a technique that can give perfect results every time. Usually, kit instructions only mention blade balancing with directions like "balance and cover rotor blades" or "finish blades according to your preference." Vague, not to mention presumptuous!

All that rotating machinery requires accurate balancing—here's how!

The following technique has worked well for me for many years, and it has the added benefit of allowing you to switch rotor blades without having to remove the rotor head and rebalance the entire assembly!

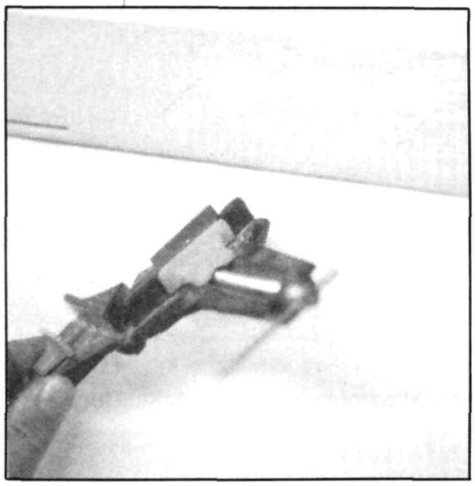


Start by weighing all rotor blade parts. A scale that's accurate to within 1/10 gram is the cornerstone of Craig's technique.

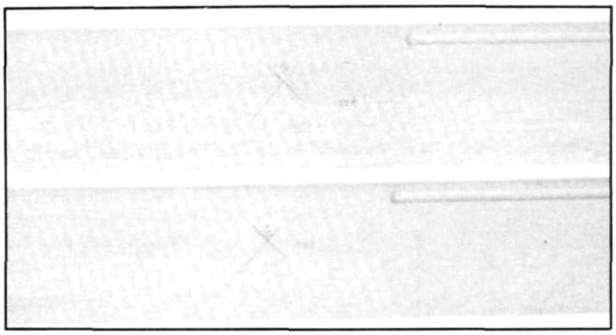
You'll need a few tools, the most important of which is a scale that can weigh up to 300 grams and is accurate to within 1/10 gram. A triple-beam balance like the one I use costs about $80 at a gun supply store or scientific supply outlet. (This is a good item to share with a friend, or purchase as a club.) You'll also need a single-edge razor blade, sandpaper, clamps, CA, a hand drill and some lead shot (or its equivalent). I use lead rod from the rotor blades of crashed machines!

Begin by weighing all the parts, including the blade grips and lead weights. This will allow you to put the heavier parts on the lighter blade, so less weight will have to be added.

Balance one rotor blade on a single-edge razor blade held in a clamp, at converging 45-degree angles (as shown in photos). Press the blade against the razor each time so it leaves a mark. The two marks will intersect at one spot—the rotor blade's center of gravity (CG). Measure to this spot in from the leading edge, and in from the blade tip. Do the same thing with the other blade and compare your figures.

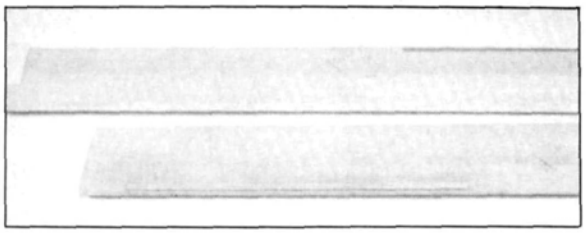


Using a straightedge razor held in a clamp, find the CG for each blade's span and chord.

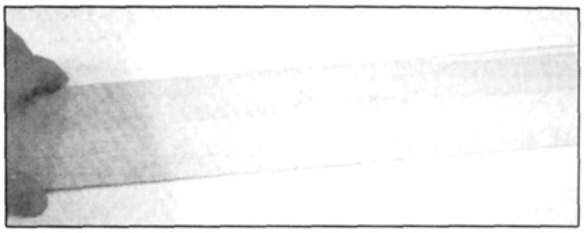


Compare the CGs of the two blades. You'll attempt to make them match in both weight and CG.

If there's only 2/10 or 3/10 gram difference between the blades, you may want to trim this amount off the lead weight that's installed in the heavy blade, especially if the lighter one's CG is farther from the tip. This will adjust the weight of



Cover lead-rod slots with balsa strips before CA cures; sand flush later.



If the blades' CGs match but their weights don't, weight is added to the blade right on the CG and evenly distributed along the CG line. This blade is now ready for covering.

the blade and help correct the CG.

If the lighter blade's CG is closer to the tip, match the two lead pieces. I'll add weight near the root end of the light blade in a later step to correct the CG. If the blades weigh the same but the CGs don't match, trim some weight from the lead of the blade on which the CG is closest to the tip. I'll correct the blade weight later.

Glue the lead rods into the rotor blades with slow CA or epoxy. Be sure to leave room for the wooden cover strips, which can be glued on at the same time; if none are provided, fill the slots with CA and baking soda or microballoons. After the CA has cured, sand the slots smooth to the blades' surface, but don't over-sand, as you could distort the airfoil.

Install the blade grips according to the manufacturer's instructions; be careful to perform this step correctly, as this is the most critical area of the blade for strength.

Re-check the CG and weight of the rotor blades. Four conditions are possible:

1.) blade weights and CGs match
2.) blade weights match; CGs don't
3.) neither blade weights nor CGs match
4.) CGs match; blade weights don't.

For condition 1, proceed to covering and finishing. For condition 2, remove weight from the blade with its CG closest to the tip by drilling small holes in the tip end. Continue to remove material and check the CGs until the two blades match. Now re-weigh the blades and weigh out exactly enough lead shot to make up the difference. Drill a hole large enough to hold the shot right on the lighter blade's CG. (More than one hole may be needed; if so, drill the holes equidistant from the CG along the spanwise CG line). Place the shot in the holes, fill them to the top with slow CA and baking soda, and sand them smooth. Re-check the weight; minor adjustments can be made after covering.

If condition 3 exists, measure enough lead shot to bring the light blade up to the weight of the heavy one, and place it on a small piece of cellophane or masking tape so it's easier to manage. Place the light blade on the single-edge razor at the point where the CG should be to match the other blade, and position the lead shot so it balances. Mark this spot exactly and drill holes just large enough for the shot. Glue the shot into place as described in condition 2.

For condition 4, add weight to the light blade directly over the CG so that the CG won't be disturbed.

It's a good idea to check both blades once more. You should now have two rotor blades, matched in weight and center of gravity, that are ready to cover and finish. If you detect a difference in blade weight greater than 1/10 gram, or a CG difference greater than 1 millimeter, repeat the above steps to correct it. Next month, I'll tell you how to cover and precision-balance the blades you've just prepared. ■

COVERING MAIN ROTOR BLADES

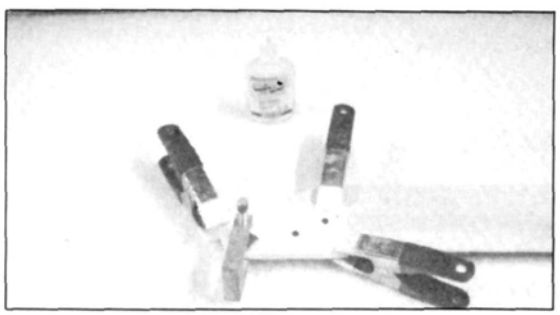
IN A PREVIOUS column I mentioned a wire and strip-metal bending tool called the "Handi-Bender." As Bob DeMond (Panama City, FL) was kind enough to point out, this useful tool isn't as easy to find as it was a few years ago. However, Bob tells me that the Micro-Mark* people now carry a Japanese-made version, at about $4.50.

This is good news. The tool, now called "Wire-Bending Jig," is highly useful, not only for wire-bending, but also in forming sheet-metal strip for cowl brackets, etc.

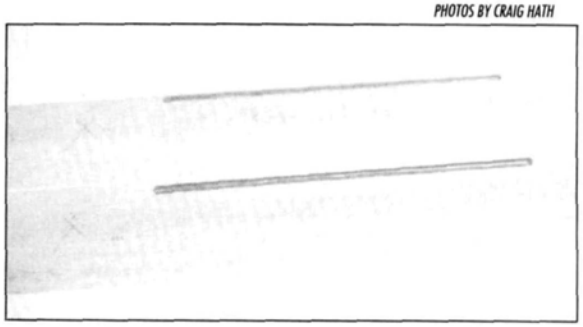
Micro-Mark has an absolutely fantastic array of modeling tools for sale by mail or phone order. Many of these are priced at remarkable discounts, too. They carry precision miniaturized versions of just about every type of wood- and metal-working tool there is; too many for me to even begin to list here. Send for their catalog; You'll be very glad you did!

**Here's the address of the supplier mentioned in this article:*
***Micro-Mark**, 340 Snyder Ave., Berkeley Heights, NJ 07922.*

PHOTOS BY CRAIG HATH



Glue on blade grips with slow CA and clamp securely until adhesive cures. Notice the Rotorsport heavy-duty blade grip used here.



Glue in the lead rods with slow CA and baking soda.

PROCTOR JENNY

(Continued from page 87)

too, but I pointed the Jenny into the wind and gave it full throttle. Within a few feet, it was airborne, climbing too steeply, requiring three-quarters down-trim on the elevator. It was also flying much too fast for a scale Jenny, so I reduced power to half-throttle, which closely simulated true scale speed.

When I calmed down, I also realized I needed a touch of left-aileron trim. Now it was flying like a true Jenny—slowly and gracefully. I wanted to see how slowly it would go in the wind, so with ample altitude, I throttled down to quarter into the wind and it virtually stood still, looking down at us like a bird of prey. Quite a sight!

The wind started to blow across the runway, and I'd have to make my approach over trees, so I increased the power until I passed them, then I slowly decreased it for my approach. This gave me a picture-perfect, two-wheel, tail-high touchdown without any wing buffeting on final. I was even able to taxi back to the pit area without having the fairly new engine cut out.

Owing to the strong winds, I couldn't perform any touch-and-gos for in-flight photos, so we did that the next weekend, when there was virtually no wind and Robin did a fine job of taking the shots. At this point, I was able to perform the most beautiful touch-and-gos and loops that looked so realistic that even Mr. Glen Curtiss would be proud of them.

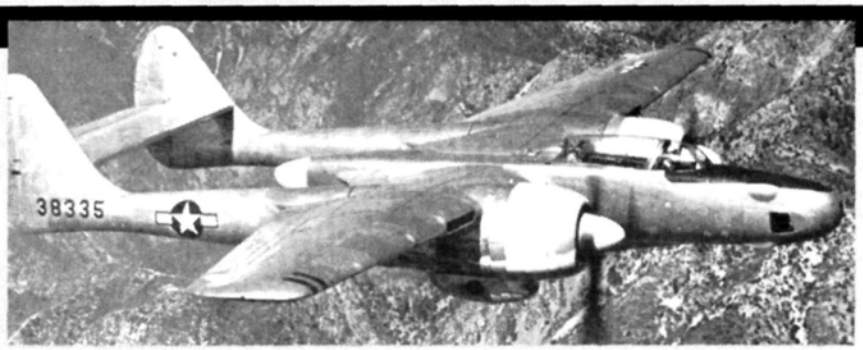
I think this Proctor kit is the *ultimate* in scale fabrication. Although Dick Heininge of Proctor says that it's a stand-off scale kit and that an average builder can construct it, with a little extra work, you can have a beautifully detailed, precision-scale Jenny with which you'll be proud to compete.

(Continued on page 119)

NAME THAT PLANE

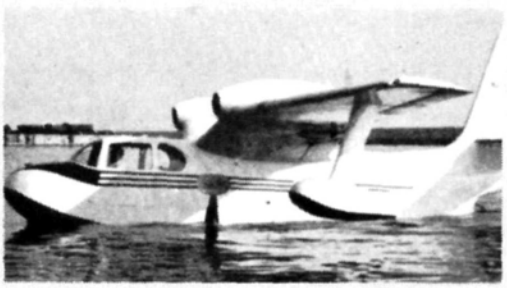
CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to **Model Airplane News**, Name That Plane (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Chad Carlin of San Jose, CA, for correctly identifying the Piaggio P.136-L Amphibian featured in the January issue! His name was chosen from the 21 correct entries we received. Chad wrote that he felt lucky and had a feeling his 1½-inch-thick *Encyclopedia of Civil Aircraft* might finally pay off. Right on both counts, Chad, and welcome to the subscribers' list!

The Piaggio P.136-L was an air/sea rescue amphibian used by the Italian Air Force in the early and mid '50s. The series comprised the baseline P.136L and the L-1 and L-2 derivatives; only the powerplant differed among the three. The version pictured, the L-1, was powered by a pair of 270hp Lycoming GO-480-B geared engines. The five-seat flying boat featured a unique, 44-foot, gull-shaped cantilever wing that allowed the engines' thrust lines to be placed closer together. The all-metal structure was aluminum alloy and the hull was of the twin-step design.



The Piaggio was first flown in 1948. Although it was a capable aircraft, only 43 were built in Italy, and another 32 were made in the USA and marketed as Royal Gulls.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

CONTRIBUTORS WANTED

We think many of our readers have ideas that are worth sharing. How many times have you read an article and said, "I could do that!" or "That's not the only way to do that; my way is easier!" Could very well be!

Here's your chance. We're expanding ***Model Airplane News*** and are looking for additional contributors to help us accomplish this objective. Of key importance is the ability to take good photographs; the writing we can help you with. Interested? It's much easier than you might think!

Let's hear from you. Send in your ideas, articles, thoughts and photos; we're looking forward to it.

Publisher
Model Airplane News
Air Age Publishing
251 Danbury Road
Wilton, CT 06897

PROCTOR JENNY

(Continued from page 116)

Building and flying this plane was a pleasure and a great experience. I recommend it highly to anyone who loves scale, gentle-flying, antique aeroplanes.

**Here are the addresses of the companies mentioned in this article:*
***Proctor Enterprises,** 25450 N.E. Eilers Rd., Aurora, OR 97002.*
***Colortex;** distributed by World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.*
***Perfect Paints;** distributed by Cheveron Hobby Products, P.O. Box 2480, Sandusky, OH 44870.*
***Formula U;** distributed by Pactra/Plasti Kote Co., 1000 Lake Rd., Medina, OH 44256.*
***Vinylwrite Custom Models,** 16043 Tulsa St., Granada Hills, CA 91344.*
***Enya Model Engines/Altech,** P.O. Box 286, Fords, NJ 08863.*
***SR Batteries, Inc.,** P.O. Box 287, Bellport, NY 11713.*
***Du-Bro Products,** 480 Bonner Rd., Wauconda, IL 60084.* ■

DARE TO RISE

(Continued from page 91)

The simulator has a box that looks just like a transmitter, and the stick movements needed to "fly" with the simulator are identical to those you make when you fly a real R/C plane. The use of this equipment meant that the students did all their crashing in the classroom and not at the field! Whew!

How did the students feel about their achievements? How do *you* feel when you take a new plane to the field and put it successfully through its paces?

WHAT'S NEXT?

If Joseph Reed is awarded the grant for which he has applied, the R/C program will be expanded to meet the needs of all the children in this bilingual school of 960 students. Eleven thousand dollars is at stake, and there are many very worthy projects competing for cash, but we're

(Continued on page 121)

READERS' REPORTS!

We'd like you to participate in our "Readers' Reports" program, which was established to give you an opportunity to voice your opinion on products you've used. The guidelines are easy: Just send us a brief 3 or 4 paragraphs and a picture or two of any kit you've built or have underway. Tell us what you thought. If we use your report with one of our regular "Field and Bench" reviews of the same product, we'll award you a complimentary subscription to *MAN*. It's that easy. Participate! Make your views known.

Some of the kits now being reviewed:

Ace All Star Bipe
Parkinson Regal Eagle
Global EZ Dago Red
Yellow Aircraft CAP-10
Miniature X-Cell 30
Hobby Lobby/Graupner Race Rat
Sig Four-Star 40
O.S. Ryan
Global EZ F-16
Kyosho Electric Mustang
Dynaflite 40 Mustang
Bonded Roun-Tuit
EZ P-51 Dallas Doll
CGM Freedom 20
R/C Design Weasel
Midwest Electric Hots
Top Flite Phasoar
Davey Systems P-47
Lanier Invader
EZ Christen Eagle
Kyosho Stratus 2000

CLASSIFIED

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis–retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

SCALE DOCUMENTATION: Plan Enlarging. Photo packs, 3-view drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport. 80-page catalog $4. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239.

PLANS ENLARGED, Large Scale Specialists. PC Model Software. Free information. Concept, P.O. Box 669E, Poway, CA 92064; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

ENGINES: IGNITION, GLOW, Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537.

OLD TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*. It contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $1.75 S&H; Foreign Surface Mail, add $2.75; Foreign Airmail, $5.50; Payment must be made in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

NOW, OAK FLIGHT BOXES! Last a lifetime. New designs for easy handling. Extra convenience. Kits or finished. Free radio flyer decal, catalog. Write: S & D Model Products, P.O. Box 4026R, Des Plaines, IL 60016.

ANTIQUE IGNITION AND GLOW PARTS CATALOG: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid U.S., Foreign $20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

WANTED: RTF U/C planes and U/C race cars, mite cars; complete or pieces, with or without engines. Buy or trade. John Fietze, Box 1521, Amagansett, NY 11930.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

CUSTOM EMBROIDERED PATCHES. Your design made any size, shape, colors. Five patch minimum. Free random sample and brochure. Hein Specialities, 7960 S.W. Manitou Trail, Glen Arbor, MI 49636.

FOR SALE: 1910-1960 model magazines, pulps, juvenile aviation books, historical aviation albums. $1 list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3

R/C WORLD—ORLANDO, FL, CONDO RENTALS—2-3 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information call Kyra, (800) 243-6685 or write to Air Age Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 2,700 different Foto-Paaks and 5,000+ drawings. Catalog $3. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

HELICOPTER SCHOOL, 5 days and nights, all equipment supplied. Plus room and board on a 67-acre airport with lodge, used exclusively for R/C Training. Opening January, 1990 in North Central Florida. Owned and operated by Ernie Huber, 5-time National Helicopter Champion and Helicopter Designer. Plan your winter or spring vacation NOW! Send $2 for complete information package to: R/C Flight Training Center, P.O. Box 727, Cresent City, FL 32112-727.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

PRIVATE COLLECTION: Hundreds of aviation magazines for sale: *Popular Aviation; Flying; Model Airplane News; Air Trails; RAF Flying Review; Wings,* and many others (1932-1960). All in excellent condition. For list, send $2 to William C. Fort, Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

STUFF YOUR MAILBOX—R/C Catalogs, info., $2. J. Braddy, 3037 Audrey Dr., Gastonia, NC 28054.

CLEVIS REMOVER, shipped, engraved, $8.50. Reynolds, 1707 Carter, Vidalia, LA 71373.

LANCASTER BOMBER. Beautiful B&W 16x20 photo for $14.95. Inquiries welcome/free brochure. CPC Productions, P.O. Box 9342, Seattle, WA 98109.

AERIALS–AERIALS–AERIALS–AERIALS–Shoot stunning action video and video-assisted stills! Build our 4-ounce, 2¹/₄x4-inch TV transmitter, under $120. Color/BW, audio subcarrier, two power levels. Complete plans, plus microcam and kit information, $9.95 +$2. S&H. Satisfaction Guaranteed. Supercircuits, 1403-A Bayview, Hermosa Beach, CA 90254.

RANDOLPH DOPE, BUTYRATE, NITRATE. Clear, colors, thinners. New sport/stunt Control Line kits, .19 to .50 engine sizes. Send $1 for information pack to, ABC Hobby Supplies, P.O. Box 2391, Clarksville, IN 47131.

FOR SALE: Shuttle helicopter never flown. Includes O.S. Max 28, Futaba 5NLH radio, GMP Gyro, remote glo adaptor. List $829, asking $495. Larry Katz, 545 Clawson St., S.I., NY 10306.

EASE-OF-FLYING RATINGS OF R/C TRAINERS, $1.95 plus 45¢ postage. Jim Waterman, 3818 Deerfield, San Antonio, TX 78218.

ENGINE COLLECTORS: The first 100 Fitzpatrick engines that were originally set aside and serialized are now available to the dedicated collector. The most beautiful engine (61) in the world. Double ball bearing. Beautiful muffler included. $299.98. (213) 477-2092. Send to Fitzpatrick #303, 2120 Bentley, West L.A., CA 90025.

INTERNATIONAL AIRCRAFT RESEARCH—need documentation? Send the name of your favorite aircraft with $3 for 3-view and photo catalog. Double previous size. 1447 Helm Crt., Mississauga, Ont., Canada, L5J 3G3.

ONE DOZEN HELPFUL HINTS for beginning radio-control pilots. Send $3 money order and SASE to: P. Carter, P.O. Box 277, Deer River, MN 56636.

WANTED: Functional Cox .010, with extra plugs and extra props. C. Little, #1 E. University Parkway, #209, Baltimore, MD 21218, (301) 235-1052.

WANTED: Compound bonner escapement with operating receiver and transmitter for escapement operation. State asking price. Legrand Feeley, 207 Bella, Iberville, Quebec, Canada, J2X4Y6

SCALE WHEELS AND TIRES. Now available for Jet Aircraft. Custom designed aluminum wheels. Solid rubber tires that will carry the weight and won't flatten. Available for F4, F16, F18, F8 and A10. Having a problem finding scale wheels and tires for your models, contact us. For more details, call or write: Glennis Aircraft, 5528 Arboga Rd., Linda, CA 95901, (916) 742-3957.

RC AIRCRAFT LOG BOOKS. High quality! Designed to keep you flying, and your equipment in air-worthy condition. For gas airplanes, gliders and helicopters. No more guessing! Keep accurate airframe, engine, flight-pack and flight-time logs. Everything is covered. You will also receive a complete pre-flight and post-flight check list. To order, send $6.95 to Lee Publishing, Dept. 207, Building 2, Suite 12, Box 877227, Wasilla, AK 99687.

AMAZING AMERICAN EAGLE GLIDER. Majestic full 21" span free-lfight glider. High-performance/authentic detail. "Awesome!" $5 plus $1 postage. GARUDA GLIDERS, Box 461N, Kula, HI 96790. (Offer expires 4/30/90.) Distributors wanted.

CLUB OF THE MONTH

DISCOVER FLYING R/C CLUB

P.O. Box 2146 Centerville, MA

OUR latest Club of the Month is named "Discover Flying R/C." That's a subtle way to enlist new members into the hobby! Located on Cape Cod, the Discover Flying R/C Club has a perfect flying field that's remote and wide open. The club recently sponsored a successful electric fly event, which was blessed with "the best two days of flying weather in R/C history"!

The December issue of the club's newsletter, "Prop Tips," features pictures of Neil Whitman and his Playboy Cabin, Jeanne Zisa with her Airtronics Eclipse and Tony Fioro's P-51 Mustang. A prolific flier, Tony is featured in other pictures with an electric chopper and a WW II Japanese Zero!

The December issue also profiled member Dick Meehan, who's a fan of vintage WW I aircraft. His first plane was a Kadet Senior with an Enya .40 and his latest is a 1/4-scale Sopwith Pup. Dick's life isn't just planes, however; his other hobby was revealed: he's a saxophone player whose latest gig was at the Coonamessett Inn on the Cape!

George Wilson offered a tip on how to set up a throttle linkage. He explained how a throttle linkage can "bottom out" against a low-speed stop in the engine, causing the throttle servo to draw stall current. He suggests that the throttle servo be installed so that its location can be adjusted (fore and aft) or the length of the throttle linkage itself changed—not with the clevis adjustment. This allows you to set the throttle to its proper initial position. Great tip, George!

We're happy to name the Discover Flying R/C Club as our Club of the Month. Two of its members will receive a free subscription to *MAN*. We wish the club success in 1990 and hope "Prop-Tips" continues to fly!

DARE TO RISE

(Continued from page 119)

rooting for Joseph Reed, Mrs. Koory and their students.

With sufficient funds, Mr. Reed plans to add aerial photography to the program, and pupils will design mountings and install cameras in their airplanes. Following methods used by the U.S. Geological Survey, they'll photograph and map their locality.

Each construction step will be videotaped, and the students will use the movie when they present their accomplishments to other classes. The taped presentation will also serve as a useful guide for other teachers.

When George Bernard Shaw wrote: "He who can, does; he who cannot, teaches," he had obviously *never* met an outstanding teacher like Joseph Reed. Mr. Reed has grasped the very essential educational principles that when students are motivated, they learn; when they learn, they achieve; when they're successful, they have high self-esteem; and this is as critical as improving reading, writing, science and problem-solving skills.

Confident students achieve more and, ultimately, we all benefit from their contribution. Why not contact the school

(Continued on page 122)

DARE TO RISE

(Continued from page 121)

board in your area to see if this type of program could be implemented in your local schools? Must California always have it all?! This is a first for R/C, and it's obviously just the beginning!

To everyone involved in the Morningside R/C program—especially those high-flying fifth- and sixth-graders who are doing such fine work—we send our congratulations. The class of '96 has dared to rise; we hope they stay up there!

Are you wondering what Mr. Reed received for Christmas '89? I didn't *dare* ask!

In addition to those already mentioned, thanks go to these people and companies for helping to make the Morningside program possible:

Tom Runge at Ace R/C; Larry at SR Batteries; Mr. Boucher at Astro Flite; Carol Glorioso at Carl Goldberg Models; Jack Albrecht at Airtronics; Futaba Corp. of America; Top Flite Models; Model Craft Mfg.; Sig; Black Baron Covering; Tower Hobbies; Leisure Inc.; Dave Brown Products. ■

MOTORS

(Continued from page 93)

Motors draw roughly 12 amps for a 6-minute flight. This isn't a great deal of amperage when compared with that demanded by cars, so you can get away with a medium to hard brush.

TENSE SPRINGS?

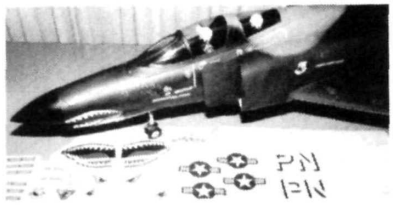
Spring tension also affects your motor, and it offers an inexpensive way to improve performance. Motor springs are available in three tensions, and your choice will depend on the application you have in mind.

- **Heavy springs** (like the soft-compound brushes) are for use in motors that draw a heavy current for short bursts. The high tension presses the brush against the commutator with more pressure than usual, and this gives a more efficient current flow, but at the expense of rpm.
- **Light springs,** on the other hand, reduce tension on the brush and commutator, and this isn't very efficient for high-torque applications, but it's great for high

(Continued on page 126)

PRODUCT NEWS

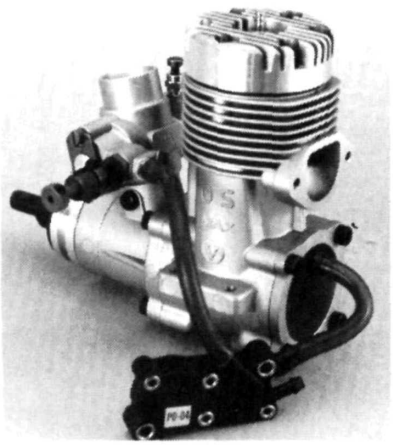
Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**



AEROLOFT DESIGNS
Precision-Scale Dry Transfers

Aeroloft Designs' hand-made, dry-transfer process allows precision-scale reproductions of any graphic, from tail numbers and squadron markings to popular WW I nose art. Examples include Dennis Crooks' F-14 Tomcat, the Bicentennial F-4B Phantom of Shailesh Patel, Charlie Chambers' Blue Angels F/A-18 Hornet, and the F-4E by Ronnie Kemp of Yellow Aircraft. Extremely thin and flexible, these dry transfers reveal details like panel lines, rivets, etc. They feature precise dimensions and color matching, easy placement and outstanding adhesion with no adhesive "halo".

For more information, contact Aeroloft Designs, P.O. Box 326, Hinsdale, IL 60522-0326.

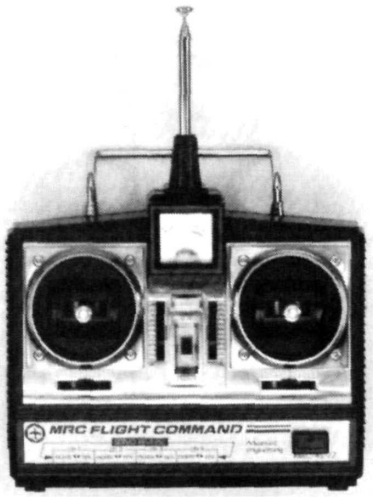


O.S.
.46VF-P ABC

The O.S. .46VF-P ABC from O.S. Engines uses a new pump to improve the .46VF's efficiency and performance. This pump and a no. 46 carb provide consistent, reliable fuel flow and allow the engine to turn out 1.55bhp at 16,000rpm.

Part no. OSMG0648. Price: $269.95.

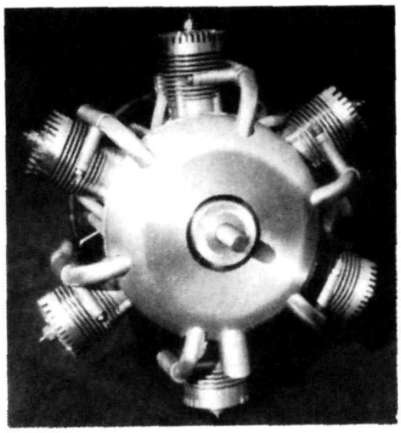
For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.



MODEL RECTIFIER
4-Channel R/C System

Model Rectifier Corp. offers a 72MHz, AM, 4-channel R/C system. The MRC Flight Command System has tight, dual-axis gimbals, click trims, adjustable stick length and tension, and servo-reversing on all four channels. The transmitter and receiver circuitry meet 1991 AMA Gold Sticker and FCC requirements. The receiver is equipped with superior noise-rejection and adjacent-channel-rejection circuitry. Other features include: Ni-Cd batteries for transmitter and receiver, a dual-output charger with LED monitor lights, a switch harness with charging jack and a frequency flag. Three, high-performance, standard-size servos with an output torque of 42 inches/ounce are included; three other types, from mini- to high-torque, are optional.

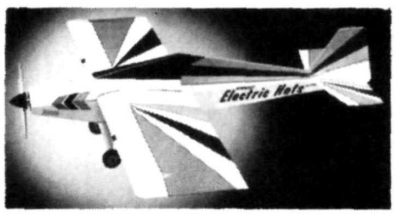
For more information, contact Model Rectifier Corp., P.O. Box 267, Edison, NJ 08818.



RADIAL ENGINE TECHNOLOGIES
2-Cycle, 6-Cylinder Powerplant

Radial Engine Technologies, Inc. now offers the Mike GR6-120 2-cycle powerplant, which generates 2.2bhp and produces 16 pounds of static thrust with an 18x8 prop at 8,000rpm. It weighs only 4.75 pounds, including integral mount and muffler. Fully flight-tested in a variety of large-scale airplanes, the GR6-120 features stainless-steel ball bearings and crankshaft, oil-lubricated gears and a simple-to-adjust, single-needle valve.

For more information, contact Radial Engine Technologies, Inc., 7 Greenwood La., Valhalla, NY 10595.



MIDWEST PRODUCTS
Electric Hots

Midwest Products' Electric Hots is quick, aerobatic and convenient. This airplane combines a sturdy airframe, powerful HP-100 electric motor (with a pre-soldered on/off switch harness) and carefully matched hardware. It has

pre-shaped wooden parts, a one-piece wing and a simple box fuselage. A Success Series construction manual provides clear illustrations and simple instructions. Extras include: lightweight wheels and aluminum landing gear, propeller and spinner, injection-molded hatch latch, pushrod linkages and connectors, Velcro for mounting equipment, and a large decal sheet.

Kit no. 165. Price: $114.95.

For more information, contact Midwest Products Co., Inc., P.O. Box 564, Hobart, IN 46342.

AVIATION RELIC PRINTS
Historic Aviation Relic Prints

Aviation Relic Prints let you own a piece of history! Attached to each one is a small piece of the aircraft's original fabric, preserved during restoration. All seven, historically significant planes depicted in the prints are in the Smithsonian Institution's collection: Wright EX Vin Fiz (first transcontinental U.S. flight); Fokker T-2 (first non-stop transcontinental U.S. flight); Bleriot XI (1914 French monoplane); deHavilland DH4 (U.S.-built WW I bomber); Albatros DVa (German WW I fighter); Curtiss NC-4 (first transatlantic flight); and the Douglas World Cruiser (first around-the-world flight). Available framed or unframed, each print comes with a signed certificate of authenticity and a colorful, two-page history of the aircraft.

For more information, contact Aviation Relic Prints, 8152 N 32nd St., P.O. Box 576, Richland, MI 49083.

SCALE PLANS AND PHOTO SERVICE
Curtiss P-40 Plans

Plans for the P-40—the famed Scale Masters competitor designed by Jerry Bates—are now available in 1/5.5 scale. The balsa-and-ply model is 69 inches long and weighs 16 to 18 pounds, and has an 82-inch wingspan and a wing area of 1105 square inches. It's designed around the Super Tigre S2000 series, but can be powered by engines ranging from a .90 cubic-inch glow to a 2-cubic-inch gas engine. Seven sheets of ink drawings for building the "E" through "N" models and a 15-page manual with scale documentation are included. Templates for all parts are shown along with commercially available parts, retract and radio installations. Fiberglass cowling, belly pan, carb air-intake scoop, wing fairings, landing-gear strut covers and a clear-molded canopy are available.

Price: $36, plus $2 postage and handling and $3 for rolled tube.

For more information, contact Scale Plans and Photo Service, Madison Ave., Greensboro, NC 27403.

POWER PAK
High-Capacity Lithium Batteries

Power Pak offers a complete selection of high-capacity lithium batteries in cylindrical and coin-cell configurations. The company's memory-protection device eliminates the need to permanently mount lithium cells to the PC board.

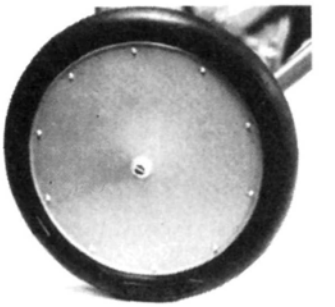
For more information, contact Power Pak, Inc., 6216 Oakton St., Morton Grove, IL 60053.

DECKSLIDER
P/M Deck Slider

The P/M Deck Slider allows quick and easy access to van and pickup-truck cargo. This welded-steel product is mounted to the bed and slides in and out on stainless-steel, ball-bearing rollers. Completely factory-assembled, it's self-locking in three positions and will support 600 pounds of cargo when fully extended. Perfect for sportsmen, the P/M Deck Slider is available in models to fit all pickups and vans, as well as specialty vehicles. The plywood deck and trim aren't included.

Price: $274.95 to $289.95, depending on model.

For more information, contact DeckSlider of Florida, 771 110th Ave. N., Naples, FL 33963.



PROCTOR ENTERPRISES
Disc Wheels

Proctor Enterprises has released the first 1/4-scale disc wheels for WW I German aircraft, and they're designed primarily for its soon-to-be-released, 1/4-scale Albatros DVa kit. These all-aluminum wheels are 7 1/2 inches in diameter and feature scale disc attachments and sidewall markings on their 1-inch-diameter rubber tires.

Price: $69.95/pair.

For more information, contact Proctor Enterprises, 25450 NE Eilers Rd., Aurora, OR 97002.

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!
Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

CONNECTICUT—Bristol
15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two-and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov.-Jan. 1-4.
BRISTOL HOBBY CENTER
641 Farmington Ave., Rte. 6 **583-7273**

CONNECTICUT—Norwalk
Connecticut's leading R/C shop. 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.
AL'S R/C SUPPLIES
54 Chestnut Hill Rd. **846-9090**

FLORIDA—Winter Springs
- UPS orders shipped daily
- Dealer for Yellow Aircraft
- Now available "Fastcover" covering material
- Omega/cool power fuels discounted
- Visit our showroom (35 min. from Disney World)

BOB FIORENZE HOBBY CENTER, INC.
420 W. S.R. 434 **(407) 327-6353**
FAX (407) 327-7148

ILLINOIS—Chicago
Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon.-Fri. 10-9; Sat. 9-6; Sun. 11-4.
STANTON HOBBY SHOP, INC.
4734 Milwaukee Ave. **283-6446**

NEW JERSEY—Red Bank
Full-line hobby shop. Ask us, we will compete with mail-order prices. Mon.-Wed. 10-6, Thr. Fri. 10-8, Sat. 10-5, Sun 12-4.
HOBBYMASTERS
62 White St. **842-6020**

OHIO—Findlay
Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.
JINX MODEL SUPPLIES
721 Rockwell Ave. **422-5589**

OKLAHOMA—Tulsa
R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC. Hours: Mon.-Sat. 10-6, Thurs. 10-8.
WINGS 'N THINGS HOBBY SUPPLY, INC.
5241 S. Peoria Ave. **745-0034**

TEXAS—Austin
Austin's largest hobby shop. Complete line of R/C airplanes, gliders, cars, boats, helicopters, parts & accessories, rockets, kites, R/C systems. Centrally located. Open 7 days a week.
AMERICAN ANGLER TACKLE & R/C HOBBY CENTER
1617 Toomey Rd. **(512) 474-8277**

TEXAS—Houston
R/C airplane specialists, R/C cars, boats, helicopters. Plastic models, rockets, trains, HO & N. "Toys for Big Boys." Mon.-Fri. 11-7, Sat. 10-6.
LARRY'S HOBBIES
156-F FM 1960 E. **443-7373**

TEXAS—New Braunfels
GUARANTEED Lowest prices on Concept 30, G.M.P., Kalt, Schluter, and X-CELL Helis, parts, accessories. Radios, Gyros, tools, etc. Other R/C products also available. 9-7 Mon.-Sat. MC/Visa welcome.
THE HELI PAD
424 Comal Ave. **(512) 620-1269**

LATIN AMERICA
COSTA RICA—San Jose
Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.
EL HOBBY SHOP
Centro Commercial, San Jose 2000
Apartado 529, Centro Colon **32-26-81**

Send sales message and payment to **Model Airplane News Hobby Shop Directory,** 251 Danbury Rd., Wilton, CT 06897.

For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Katherine Tolliver.

MOTORS

(Continued from page 122)

revs. For electric airplane motors, which maintain a relatively constant current flow, light or medium springs are most suitable.

Maintenance of open-end-bell or modified motors is much easier because you can remove the brushes and clean the commutator with the new cleaning sticks, or you can completely remove the end bell and pull the armature out for a more thorough cleaning.

The abrasive commutator cleaning sticks are designed to be inserted through the brush hoods to clean the carbon off the commutator. They're effective, but avoid applying too much pressure, or you could wear the commutator out of round.

For basic maintenance, the rules outlined for closed-end-bell motors also apply to the open-end-bell variety. Spray the motor with a motor cleaner and, although many of the modified, open-end-bell motors have bearings instead of bushings, oil them lightly to keep them running freely.

If you're confused about methods of changing brushes and springs, don't worry about making changes to your motor, but concentrate on developing your flying skills. The changes you can make will improve your motor's performance slightly, but regular maintenance is considerably more important. By keeping the motor clean and well-lubricated, you'll extend its life considerably. Motor maintenance should always come first; after that, you can tailor your motor to your particular airplane.

Taking care sure beats repair! ■

ADVERTISER INDEX

SPORTY SCALE

(Continued from page 95)

attractive, don't you think? If you absolutely *can't* make one of these yourself, or if you don't want to spend the $300 for the special rubber to make the mold, and if you absolutely *must* have a 1/5-scale radial engine face, drop me a line*. I'm charging $25, and that includes UPS costs.

Last, but not least, the Colonel's aide forgot to include David Klaus's address a few months ago. For those who missed it, get your cross-reference color-chip guide from David at 3404 Ramsgate Terrace, Alexandria, VA 22309-2142.

Well that's it for this month, scale fans. Before leaving you, I'd just like to remind you of one thing: check your six!

**Here are the addresses of the companies mentioned in this article:*

Nick Ziroli Models, *29 Edgar Dr., Smithtown, NY 11787.*

Red Max Fuel; *distributed by FHS Supply Inc., P.O. Box 9, Clover, SC 29710.*

Barton Machining, *11640 Salinez, Garden Grove, CA 92643.*

Circus Hobbies, *4105 Fieldstone, Champaign, IL 61821.*

Dave Platt Models, *1306 Havre NW, Palm Bay, FL 32907.*

Don Smith, *2260 N. Dixie Hwy., Boca Raton, FL 33431.*

Frank Tiano Enterprises, *2460 SW 85th Terrace, Davie, FL 33324.*

Griffin Manufacturing, *P.O. Box 308, Webster, NY 14580.* ■

GMP REBEL

(Continued from page 104)

flights to shorten the learning curve.

GMP's Rebel opens the door for modelers who want to try helicopters. It doesn't cost an arm and a leg, so experimenting with a different flying machine won't upset your budget. Being fixed pitch doesn't make it a throwback; you can learn about model helicopters from the Rebel and then progress to more sophisticated machines, or you can make it your sole helicopter and enjoy it for a long time.

**Here are the addresses of the companies mentioned in this article:*

Gorham Model Products, *23961 Craftsman Rd., Calabasas, CA 91302.*

Fox Manufacturing Company, *5305 Towson Ave., Fort Smith, AR 72901.*

Royal Products Corp., *790 W. Tennessee Ave., Denver, CO 80223.*

Coverite, *420 Babylon Rd., Horsham, PA 19044.*

Sullivan Products, *1 N. Haven St., P.O. Box 5166, Baltimore, MD 21224.* ■